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Part II

Environmental Protection Agency

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40 CFR Part 80

Regulation of Fuels and Fuel Additives; Standards for Reformulated and Conventional Gasoline;

Final Rule

ENVIRONMENTAL PROTECTION AGENCY

40 CFR Part 80

[AMS-FRL-4817-8]

Regulation of Fuels and Fuel Additives: Standards for Reformulated and Conventional Gasoline

AGENCY: Environmental Protection Agency.

ACTION: Final rule.

SUMMARY: Through the amended Clean Air Act of 1990, Congress mandated that EPA promulgate new regulations requiring that gasoline sold in certain areas be reformulated to reduce vehicle emissions of toxic and ozone-forming compounds. This document finalizes the rules for the certification and enforcement of reformulated gasoline and provisions for unreformulated or conventional gasoline.

DATES: The regulations for the reformulated gasoline program are effective on March 18, 1994. The incorporation by reference of certain publications listed in the regulations is approved by the Director of the Federal Register as of March 18, 1994. The information collection requirements contained in 40 CFR part 80 have not been approved by the Office of Management and Budget (OMB) and are not effective until OMB has approved them. EPA will publish a document in the Federal Register following OMB approval of the information collection requirements. Retail sale of reformulated gasoline will begin on January 1, 1995, as will the provisions for the ``simple model'' certification, the anti-dumping program for conventional gasoline, and the associated enforcement procedures. (For all ensuing sections of this document, the program's beginning date of January 1, 1995 refers only to the retail sale of reformulated gasoline.) Certification of reformulated gasoline by the ``complex model'' and compliance with the Phase II performance standards, will begin January 1, 1998 and January 1, 2000, respectively.

ADDRESSES: Materials relevant to this FRM are contained in Public Dockets A-92-01 and A-92-12, located at room M-1500, Waterside Mall (ground floor), U.S. Environmental Protection Agency, 401 M Street SW., Washington, DC 20460. The docket may be inspected

from 8 a.m. until 12 noon and from 1:30 p.m. until 3 p.m. Monday through Friday. A reasonable fee may be charged by EPA for copying docket materials. FOR FURTHER INFORMATION CONTACT:
Paul Machiele (reformulated gasoline requirements), U.S. EPA (RDSD-12), Regulation Development and Support Division, 2565 Plymouth Road, Ann Arbor, MI 48105, Telephone: (313) 668-4264. George Lawrence (reformulated gasoline and anti-dumping enforcement requirements), U.S. EPA (6406J), Field Operations and Support Division, 501 3rd Street, Washington, DC 20005, Telephone: (202) 233-9307.

SUPPLEMENTARY INFORMATION: Today's final rule is preceded by four previous notices: an initial notice proposing standards for reformulated and conventional gasoline (NPRM) published on July 9, 1991 (56 FR 31176), a supplemental notice (SNPRM) published on April 16, 1992 (57 FR 13416), an additional NPRM published on February 26, 1993 (58 FR 11722), and a notice of correction for Phase II standards published on April 1, 1993 (58 FR 17175). Insofar as the rules finalized today mirror the proposed standards, those previous documents may be referred to.

Today's preamble explains the basis and purpose of the final rule, focusing on issues that have been revised since the publication of the correction notice for the Phase II performance standards (58 FR 17175). Support documents, including the Regulatory Impact Analysis (RIA), are available in Public Docket No. A-92-12. To Request Copies of This Final Rule Contact: Delores Frank, U.S. EPA (RDSD-12), Regulation Development and Support Division, 2565 Plymouth Road, Ann Arbor, MI 48105, Telephone: (313) 668-4295. Copies of the preamble, the Final Regulatory Impact Analysis (RIA), the Responses to Comments on Enforcement Provisions (RCEP), the complex model, the simple model and the regulations for the reformulated gasoline rulemaking are available on the OAQPS Technology Transfer Network Bulletin Board System (TTNBBS). The TTNBBS can be accessed with a dial-in phone line and a high-speed modem (PH# 919-541-5742). The parity of your modem should be set to none, the data bits to 8, and the stop bits to 1. Either a 1200, 2400, or 9600 baud modem should be used. When first signing on, the user will be required to answer some basic informational questions for registration purposes. After completing the registration process, proceed through the following series of menus: (M) OMS
(K) Rulemaking and Reporting
(3) Fuels
(9) Reformulated gasoline

A list of ZIP files will be shown, all of which are related to the reformulated gasoline rulemaking process. The six documents mentioned above will be in the form of a ZIP file and can be identified by the following titles: ``PREAMBLE.ZIP" (preamble); ``RIAFINAL.ZIP" (RIA); ``ENFORCE.ZIP" (RCEP); ``EPAFINAL.ZIP" (complex model); ``MODFINAL.ZIP" (simple model); ``REGFINAL.ZIP" (regulations). To download these files, type the instructions below and transfer according to the appropriate software on your computer:
<D>ownload, <P>rotocol, <E>xamine, <N>ew, <L>ist, or <Help Selection or <CR> to exit: D filename.zip

You will be given a list of transfer protocols from which you must choose one that matches

with the terminal software on your own computer. Then go into your own software and tell it to receive the file using the same protocol. Programs and instructions for dearchiving compressed files can be found via <S>ystems Utilities from the top menu, under <A>rchivers/de-archivers.

I. Background

The purpose of the reformulated gasoline regulations is to improve air quality by requiring that gasoline be reformulated to reduce motor vehicle emissions of toxic and tropospheric ozone-forming compounds, as prescribed by section 211(k)(1) of the Clean Air Act (CAA or the Act), as amended. This section of the Act mandates that reformulated gasoline be sold in the nine largest metropolitan areas with the most severe summertime ozone levels and other ozone nonattainment areas that opt into the program. It also prohibits conventional gasoline sold in the rest of the country from becoming any more polluting than it was in 1990. This requirement ensures that refiners do not ``dump" fuel components that are restricted in reformulated gasoline and that cause environmentally harmful emissions into conventional gasoline. Section 211(k)(l) directs EPA to issue regulations that, beginning in 1995, ``require the greatest reduction in emissions of ozone-forming and toxic air pollutants (``toxics") achievable through the reformulation of conventional gasoline, taking into consideration the cost of achieving such emission reductions, any non air-quality and other air-quality related health and environmental impacts and energy requirements." The Act mandates certain requirements for the reformulated gasoline program. Section 211(k)(3) specifies that the minimum requirement for reductions of volatile organic compounds (VOC) and toxics for 1995 through 1999, or Phase I of the reformulated gasoline program, must require the more stringent of either a formula fuel or an emission reductions performance standard, measured on a mass basis, equal to 15 percent of baseline emissions. Baseline emissions are the emissions of 1990 model year vehicles operated on a specified baseline gasoline. CAA compositional specifications for reformulated gasoline

include a 2.0 weight percent oxygen minimum and a 1.0 volume percent benzene maximum.

For the year 2000 and beyond, the Act specifies that the VOC and toxics performance standards must be no less than that of the formula fuel or a 25 percent reduction from baseline emissions, whichever is more stringent. EPA can adjust this standard upward or downward taking into account such factors as feasibility and cost, but in no case can it be less than 20 percent. These are known as the Phase II reformulated gasoline performance standards. Taken together, sections 211(k)(1) and 211(k)(3) call for the Agency to set standards that achieve the most stringent level of control, taking into account the specified factors, but no less stringent than those described by section 211(k)(3).

The reader may refer to the April 16, 1992 SNPRM (57 FR 13416) and the February 26, 1993 NPRM (58 FR 11722) described in more detail below), the February 1993 Draft Regulatory Impact Analysis (DRIA), the Final Regulatory Impact Analysis (RIA), and Public Dockets A-91-02 and A-92-12 for a thorough description of the goals and regulatory development of the reformulated and anti-dumping programs and discussions of a number of associated technical issues.

A. Regulatory Negotiation (Reg Neg)

Shortly after passage of the Clean Air Act Amendments of 1990, EPA entered into a regulatory negotiation with interested parties to develop specific proposals for implementing both the reformulated gasoline and related anti-dumping programs. These parties included representatives of the oil and automobile industries, vehicle owners, state air pollution control officials, oxygenate suppliers, gasoline retailers, environmental organizations, and citizens' groups. (See the 1991 NPRM for the members of the negotiating committee and a discussion of the process for selecting them.)

In August 1991 the committee reached consensus on a program outline and signed an ``Agreement in Principle'' describing that consensus. EPA agreed to propose a two-step approach to reformulated gasoline. The first step would take effect in 1995 and utilize a ``simple model'' to certify that a gasoline meets applicable emission reduction standards. The simple model allows certification based on a fuel's oxygen, benzene, heavy metal and aromatics content and Reid Vapor Pressure (RVP).

Under the second step, according to the regulatory negotiation agreement, EPA would propose a ``complex model'' to supplant the simple model for certifying compliance with these standards. Certification under the complex model would take effect 4 years after it is promulgated. EPA also agreed to propose the more stringent Phase II emission performance standards.

B. July 9, 1991 NPRM (56 FR 31176)

The first NPRM for the reformulated gasoline program was published prior to the conclusion on the regulatory negotiations. Normally, in a negotiated rulemaking, such a reg-neg committee meets to develop a proposed rule which will be acceptable to all parties. If consensus is reached on a proposed rule, it is published as an NPRM. The committee members and the entities they represent agree to support the proposal and not to seek judicial review of the final rule if it has the same substance and effect as the consensus proposal. In this case, EPA published an NPRM while the advisory committee was still conducting negotiations. The Agency believed that although consensus of the members on an acceptable rule was possible, an NPRM was required at that time in order to meet the statutory deadline. The 1991 NPRM described the provisions of both a program to require the sale of gasoline which reduces emissions of toxics and ozoneforming volatile organic compounds (VOCs) in certain nonattainment areas and a program to prohibit the gasoline sold in the rest of the country from becoming more polluting. The 1991

notice described the outline of the reformulated gasoline program as required by statutory provisions and options that the regulatory negotiation committee members were considering. Topics included in the 1991 proposal consisted of the derivation of the emission standards, fuel certification by modeling, opt-in provisions, credits, anti-dumping requirements, and enforcement provisions for all aspects of the reformulated gasoline program.

C. April 16, 1992 SNPRM (57 FR 13416)

As noted above, the Agency's SNPRM (57 FR 13416) reflected the agreement reached in the regulatory negotiation that had been conducted to develop reformulated gasoline regulations under section 211(k). The Supplemental Notice of Proposed Rulemaking (SNPRM) described the standards and enforcement scheme for both reformulated and conventional gasoline. It also included specific proposals for the simple emission model to be used in gasoline certification and enforcement.

D. February 26, 1993 NPRM (58 FR 11722)

In their comments on the SNPRM, the ethanol industry expressed concern that the reformulated gasoline rulemaking, as proposed in the SNPRM, effectively excluded ethanol from the reformulated gasoline market. In an attempt to address their concern, the Agency proposed an ethanol incentive program, at the direction of former President Bush, intended to promote the use of ethanol (and other renewable oxygenates) in reformulated gasoline. The objective of the proposed renewable oxygenate program was to enhance the market share for renewable oxygenates while, theoretically, maintaining the overall environmental benefits of the reformulated gasoline simple model. This would be accomplished by offsetting any increase in volatility that may result from the inclusion of ethanol with volatility reductions that occur in the rest of the RFG pool. This volatility balancing, however would not take into account any

increase in volatility in-use due to mixing of ethanol and non-ethanol gasoline blends (commingling). The renewable oxygenate program would not be required in class B areas (the South) unless a state requested inclusion in the program. Thus, the NPRM (58 FR 11722) for reformulated gasoline proposed revisions to the simple model, as well as to the associated anti-dumping, and enforcement provisions. Also included in the NPRM were the proposed complex model for certification of reformulated gasoline and the proposed Phase II performance standards. The complex model is now scheduled to take effect January 1, 1998. The complex model will provide a method of certification based on the fuel characteristics such as oxygen, benzene, aromatics, RVP, sulfur, olefins and the percent of fuel evaporated at 200 and 300 degrees Fahrenheit (E200 and E300, respectively). The NPRM also proposed Phase II standards for reformulated gasoline which are to take effect in the year 2000, as prescribed by section 211(k)(3) of the Clean Air Act (CAA). The proposed VOC performance standard was 20-32 percent for class B and 26- 35 percent for class C. EPA proposed to set the toxic standard at 20 or 25 percent reduction since additional toxics control was not found to be cost effective and, in most cases, these greater toxics reductions were expected to occur through fuel reformulation for VOC control. The NPRM also included proposed NO<INF>x performance standards of 0-16 percent in classes B and C. The proposed NO<INF>x standards greater than zero were not required by the CAAA, but were proposed under the authority of section 211(c)(1) in conjunction with the Phase II reformulated gasoline standards of the Act since additional NO<INF>x control was deemed beneficial and cost effective in reducing ambient ozone levels.

E. Discussion of Major Comments and Issues

EPA received a number of comments on the first NPRM (56 FR 31176), the SNPRM (57 FR 13416), and the latest NPRM (58 FR 11722) for reformulated and conventional gasoline.

Comments covered a wide range of topics including regulatory procedure, certification standards, modeling emissions by the simple and complex models, the role of ethanol and other oxygenates in reformulated gasoline, vehicle testing, the anti-dumping program, Phase II standards, cost-effectiveness, and a number of enforcement-related issues. EPA has conducted an analysis of the comments received and duly considered the significant issues. Summaries of these comments and EPA's responses to them are contained in the Final Regulatory Impact Analysis and the Summary and Analysis of Comments which has been placed in the docket for this rulemaking (Public Docket No. A-92-12). Since the publication of the NPRM, the Agency has continued to develop the complex model. The first revisions of the complex emissions model since 1993 NPRM publication for reformulated gasoline have been provided to the public at a June 2, 1993 public workshop. EPA developed several complex model options in July which was provided to the public. In October of 1993, a draft version of the final complex model was released for public inspection as well. All the iterations of the complex model since the publication of the 1993 NPRM have been available to the public via a public electronic bulletin board and in submittals to the EPA Air Docket, Docket No. A-92-12.

All the various components of this rulemaking are being finalized in today's notice. The additional time has allowed adequate public review of the complex model and its implications for the reformulated gasoline Phase II standards.

The remainder of this preamble is organized into the following sections:

II. Treatment of Ethanol

III. Simple Model for Reformulated Gasoline Compliance IV. Complex Model

V. Augmenting the Models Through Testing VI. Phase II (Post-1999) Reformulated Gasoline Performance Standards and NO<INF>x Standards for Reformulated Gasoline VII. Enforcement

VIII. Anti-Dumping Requirements for Conventional Gasoline IX. Anti-Dumping Compliance and Enforcement Requirements for Conventional Gasoline

X. Provisions for Opt-In by Other Ozone Non-Attainment Areas XI. Federal Preemption

XII. Environmental and Economic Impacts XIII. Public Participation

XIV. Compliance With the Regulatory Flexibility Act XV. Statutory Authority

XVI. Administrative Designation and Regulatory Analysis XVII. Compliance With the Paperwork Reduction Act XVIII. Notice Regarding Registration of Reformulated Gasolines

II. Treatment of Ethanol

A. Background

The April 16, 1992 proposal of the Simple Model and Phase I standards was designed to be fuel and oxygenate neutral. Ethanol, however, when added to gasoline in the amount needed to satisfy the oxygen content requirement of the Act raises the Reid vapor pressure (RVP) of the resulting blend by about 1 psi, making it more difficult for ethanol blends to meet the mass VOC performance standards than blends using other oxygenates. For ethanol to be blended with the RFG, a blendstock gasoline with an RVP low enough to offset the increase resulting from adding ethanol would have to be obtained. Ethanol industry representatives commented that obtaining such blendstocks would be both difficult and expensive, because ``sub-RVP'' blendstocks would be more costly to refine and because blendstock production would be controlled by petroleum refiners. Methyl tertiary butyl ether (MTBE), an oxygenate which does not boost a fuel's RVP, which is derived from methanol gas and the petroleum product isobutylene and whose blends can readily be put through petroleum pipelines, was thought to be the oxygenate of choice for most refiners. Ethanol's representatives theorized that the oil industry would have a desire to use MTBE over ethanol and, thus, little incentive to make the sub-RVP blendstock necessary for

ethanol blending. The ethanol industry contended that a reformulated gasoline program which they argued would effectively preclude ethanol was contrary to Congress' intent that ethanol have a role in the program. They argued that the oxygen content requirement of section 211(k)(2) was motivated in large part by a desire to expand markets for ethanol. They noted the strong support afforded the RFG legislative initiative by members of Congress from agricultural states. They also cited statements in the legislative history indicating some members' expectation that the RFG program would provide an increasing market for ethanol. Ethanol representatives contended that the benefits of ethanol use justify its inclusion in the RFG program. Specifically, they explained that ethanol is currently made in the United States from domesticallygrown grains, primarily corn, and thus represents an important domestic and renewable source of energy. They further explained that to the extent ethanol is used in place of imported petroleum products, it promotes the nation's energy independence and improves its balance of trade, and that ethanol use also strengthens the market for corn, consequently reducing the need for price supports. Moreover, as a biomass-based product, ethanol is potentially a renewable fuel to the extent the energy derived exceeds any fossil fuel energy consumed in producing the ethanol.

In view of ethanol's importance to the nation's energy security and agricultural economy, ethanol representatives urged that the proposal be revised to allow ethanol to effectively participate in the RFG market. They suggested several possible revisions. For example, they argued that the 1 psi waiver granted to certain ethanol blends by section 211(h) of the CAA be applied to ethanol-blended RFG under section 211(k). They reasoned that since Congress recognized in the provision requiring nationwide reductions in fuel RVP that ethanol required such a waiver, ethanol should receive a similar waiver if the VOC performance standard for RFG sold in the smoggiest cities were defined in terms of a required reduction in RVP. If the

section 211(h) waiver were not available to RFG ethanol blends, the ethanol industry suggested that the VOC reduction requirement take into account that specific VOCs from various reformulated gasolines differ in their ozone formation potential. While ethanol raises a fuel's volatility and thus its VOC emissions, they argued that the resulting VOCs are less ozone-forming than those that would otherwise occur. They urged that the 15 percent reduction requirement should thus be interpreted to require a 15 percent reduction in ozone-forming potential, not simply mass of ozone-forming VOCs. Ethanol supporters suggested additional ways of encouraging or even requiring ethanol use in RFG. The Governors Ethanol Coalition, for instance, suggested that EPA require the RFG market to satisfy its oxygenate requirements through a minimum percentage of domestically produced renewable fuel.

Based on ethanol's importance to the nation's energy and agricultural policy, President Bush on October 1, 1992 announced a plan to allow ethanol to effectively compete in the RFG program, with the expectation that, with barriers removed, ethanol use would grow. In lieu of an RVP waiver, or inclusion of ozone reactivity this plan was based upon provisions of section 211(k)(1) allowing the Administrator to take into consideration cost, energy requirements, and other specified factors in setting RFG performance standards. The most significant part of this plan called for EPA to ``establish rules for reformulated gasoline in all northern cities that will have the effect of granting a one-pound waiver for the first 30 percent market share of ethanol blends, while achieving environmental benefits comparable to those provided for in EPA's proposed rule and regulatory negotiation." The environmental benefits of the proposed RFG program would be maintained by offsetting any increase in volatility of RFG containing ethanol with reductions in the volatility of the rest of the reformulated gasoline pool. In response to the announcement by former President Bush, EPA proposed on February 26, 1993 provisions to

provide an RVP (and VOC) incentive for the use in reformulated gasoline of renewable oxygenates such as ethanol.

B. Concerns With the Proposal

At the time of the February 26, 1993 proposal, EPA had a number of concerns with respect to its legality, energy benefits, and environmental neutrality. Nevertheless, we proposed the provisions for public comment in the hope that these concerns could be overcome based on new data and information developed in-house or received through public comment. Since the time of the proposal these concerns have been enhanced. Additional data and information has been developed which indicates that energy benefits would be unlikely to occur as a result of the proposal. While the production of much of the ethanol in the country produces on the margin more energy and uses less petroleum than went into its production, a recent study by the Department of Energy (refer to DOE's comments on the proposal) indicates that the margin disappears when ethanol is mixed with gasoline. The energy loss and additional petroleum consumption necessary to reduce the volatility of the blend to offset the volatility increase caused by the ethanol causes the energy balance and petroleum balance to go negative. Since the potential energy benefits were the basis in the proposal for providing the incentives for renewable oxygenates, the justification for the proposal no longer exists.

Additional data and information has also been developed which indicates that VOC emissions would increase significantly under the proposal. As discussed in section I of the RIA, the commingling effect of mixing ethanol blends with non-ethanol blends in consumer's fuel tanks, the effect of ethanol on the distillation curve of the blend, and unrestricted early use of the complex model combined result in roughly a 6-7.5% increase in gasoline vehicle VOC emissions even though there is no increase in the average RVP of in-use gasoline. As a result,

the proposal would have sacrificed 40 to 50 percent of the VOC control that is required under section 211(k) for reformulated gasoline in exchange for incentives for what is likely to have been only a marginal increase in the market share of ethanol in reformulated gasoline and no energy benefits or cost savings. As discussed in section I of the RIA, ethanol is not excluded from competing in the reformulated gasoline market under the provisions of the April 16, 1992 SNPRM. As a result of the economic advantage of ethanol over other oxygenates, ethanol should maintain a significant market share under the reformulated gasoline program even without the renewable oxygenate incentives proposed in the February 16, 1993 proposal. As a result, the actual ethanol market share increase as a result of the renewable oxygenate provisions would be expected to be far less than the maximum of 30% for which incentives were provided. Given the relatively small increase in ethanol demand as a result of the renewable oxygenate provisions in exchange for such a large loss in the environmental control of the reformulated gasoline program, there does not appear to be any justification for promulgating these provisions.

Furthermore, comments were received from virtually all parties, including ethanol industry representatives, that the proposal was unworkable and would significantly increase the cost of the reformulated gasoline program. While EPA maintains that the program would have provided an economic incentive for the use of renewable oxygenates in reformulated gasoline up to a 30% market share, EPA acknowledges that the proposal would have intruded into the efficient operation of the marketplace, impacting the cost of the reformulated gasoline program. As a result, after taking into account the cost, nonair quality and environmental impacts, and energy impacts, EPA has found itself with no choice but to back away from the renewable oxygenate provisions of the February 26, 1993 proposal.

C. Provisions for the Final Rule

In lieu of the renewable oxygenate proposal, EPA investigated a number of options aimed at making the program more workable by reducing the fuel tracking, recordkeeping, and enforcement burden associated with the proposal. While such options tended to make the program more workable from the standpoint of the refining and fuel distribution processes, they also tended to either reduce the assurance that the environmental benefits of the program would be achieved in all areas covered by the RFG program, or to place additional restrictions on the flexibility contained in the proposal for blending ethanol into gasoline. Given this and the other concerns with the proposal (cost, lack of energy benefits, significant environmental loss, etc.), EPA did not believe these options to be appropriate or justifiable either under the provisions of section 211(k) of the Act. The reader is referred to the Final Regulatory Impact Analysis for a detailed discussion of the renewable oxygenate program.

A number of commenters suggested alternative provisions (1.0 psi RVP waiver for ethanol blends, inclusion of ozone reactivity in the standard setting process, mandates for refiners to provide clear gasoline blendstock for downstream blending with ethanol, etc.) to the proposed renewable oxygenate program to allow ethanol to play a larger role in the reformulated gasoline program. It was argued that without such provisions ethanol would be excluded from the market entirely in direct conflict with the intent of Congress in the CAA. EPA, however, does not agree that ethanol is excluded from competing in the reformulated gasoline marketplace under the provisions of the April 16, 1992 proposal. In fact, as under the recently implemented wintertime oxygenated fuels program, ethanol is expected to significantly increase its market share under the reformulated gasoline program, especially in Midwestern areas where ethanol enjoys State tax incentives and relatively low distribution costs. In addition, not only is ethanol expected to compete as an alcohol, but it also may compete with methanol as an ether feedstock

in the future. As a result, EPA believes that the treatment of ethanol blends under the April 16, 1992 proposal is entirely consistent with the intent of Congress as expressed in section 211(k) of the CAA. The alternative provisions (1.0 psi RVP waiver for ethanol blends, inclusion of ozone reactivity in the standard setting process, mandates for refiners to provide clear gasoline blendstock for downstream blending with ethanol, etc.) suggested by various commenters to further enhance the competitiveness of ethanol in the reformulated gasoline program are not appropriate. These provisions are both outside of EPA's legal authority under the CAA, and indefensible from an environmental and scientific standpoint. The 1.0 psi waiver for example, could easily forfeit all VOC emission reductions otherwise achieved by the reformulated gasoline program. A move away from the mass based standards of the Act to reactivity based standards is not only unsupportable on the basis of the available scientific information, but even if EPA were able to do so, it would be unlikely to provide any significant advantage for ethanol blends. As discussed in section I of the RIA, the recent urban airshed modeling studies claiming that ethanol blends with a 1.0 psi waiver do not increase ozone relative to an MTBE blended reformulated gasoline are frought with invalid assumptions and inconsistencies and are not applicable to the reformulated gasoline situation. As a result, they provide no credible scientific support for special provisions for ethanol in the context of the reformulated gasoline program.

Given the lack of justification for the renewable oxygenate provisions of the February 26, 1993 proposal, the options considered for simplifying that proposal, and other alternative provisions recommended by commenters, EPA is, thus, basing the oxygenate-related provisions of the final rule on the provisions as proposed in the April 16, 1992 proposal. Despite this decision, EPA still believes ethanol will be able to compete favorably in the reformulated gasoline market either as a direct additive or as an ether feedstock as discussed above. As such,

EPA believes that the nationwide production of ethanol will increase as a result of this rulemaking with corresponding benefits to our Nation's agricultural sector. However, the increase may not be as large as it otherwise would have been had an incentive program been promulgated for ethanol. The reader is referred to section I. of the RIA for additional description of the comments and information which led up to this decision.

III. Simple Model for Reformulated Gasoline Compliance

In accordance with section 211(k) of the Clean Air Act, EPA requires that in order for a gasoline to be certified as reformulated, it must contain at least 2.0 weight percent oxygen, no more than 1.0 volume percent benzene, and no heavy metals (unless a waiver is granted); result in no increase in NO<INF>X emissions; and achieve required toxics and VOC emission reductions. The VOC, NO<INF>X, and toxics emission requirements effective between January 1, 1995 and December 31, 1997 and EPA's derivation of them are set forth below. Two methods by which refiners can certify their fuel as meeting the VOC, NO<INF>X, and toxics requirements of reformulated gasoline are contained in this rulemaking. The first, by use of a ``Simple Model,'' is described in this section. A second method, the use of the ``Complex Model'' is described in Section IV. Provisions for augmenting the Complex Model through vehicle testing are described in Section V. For reasons set forth in the April 16, 1992 SNPRM (57 FR 13417-13418) and discussed Section V, vehicle testing is not an option as a separate, stand-alone method of certification. First, models can better reflect in-use emission effects since they can be based on the results of multiple test programs. Second, individual test programs may be biased, either intentionally or unintentionally. Third, fuel compositions tend to vary due in part to factors beyond the control of fuel suppliers, potentially requiring testing of each batch if a model is not used. Finally, models make more efficient use of scarce and expensive emissions

effects data than is otherwise possible. For these reasons, EPA believes that the modeling options promulgated by EPA are necessary for the reformulated gasoline program to achieve its environmental objectives and to minimize the costs of the program. Comments were received suggesting that EPA allow certification based on testing as an optional means of certification. However, for the same reasons discussed above, EPA does not believe such an option would be appropriate. EPA would have much less certainty that the results of the test program were valid.

At the time of the simple model proposal, while a number of fuel parameters were thought to impact emissions, data were sufficient for only a few of these parameters (Reid vapor pressure, fuel oxygen, benzene, and aromatics) to quantify their effect with reasonable accuracy for use in an emissions model. For those additional parameters which were thought to impact emissions in a directionally clear, but as of yet unquantifiable manner (sulfur, T90, and olefins), EPA proposed that they be capped at the refiner's 1990 average level to prevent emission effects from changes in their levels from undercutting the emission reductions achieved by the parameters contained in the simple model. The effect of aromatics on VOC and NO<INF>X emissions was also unclear, but instead of being capped, it was believed that the level of aromatics would be controlled by the role aromatics plays in the formation of air toxics emissions.

Data is now available to accurately quantify not only the effects of RVP, oxygen, benzene, and aromatics on emissions, but also sulfur, T90 (or E300), olefins, and T50 (or E200). The effects of these fuel parameters are incorporated into the Complex Model described in Section IV.

The Complex Model is the most accurate and complete model currently available for use in the reformulated gasoline program. Absent any other considerations, EPA would require use of the Complex Model for purposes of certification. However, based on leadtime considerations, EPA is allowing use of either the Simple or Complex Model during the first three years of the

reformulated gasoline program as proposed. These lead time considerations were described in the April 1992 proposal (57 FR 13417-8). EPA is providing four years leadtime before use of the Complex Model is mandatory to allow the regulated industry adequate time to plan and design necessary refinery modifications, obtain necessary permits and capital, complete construction, and complete start-up and equipment shakedown. Furthermore, EPA has every confidence that on average the refiners certifying their fuel using the Simple Model will achieve the emission reductions that Congress intended for the reformulated gasoline program. Various comments were received criticizing the use of the Simple Model for fuel certification, stating that it had limited flexibility, discouraged innovation, penalized refiners producing cleaner than average gasoline in 1990, and should be scrapped. Many of these comments would appear to be resolved by the option available for early use of the Complex Model. Therefore, in keeping with the need to provide adequate lead time and the fact that compliance with the Simple Model will produce the mandatory VOC and toxic emission reductions, refiners will be permitted to use the simple model for certification until December 31, 1997. Until this date, fuel suppliers will have the option of using the complex model instead of the simple model to take advantage of the effects of parameters contained in the complex model but not contained in the simple model (as described in the following paragraphs). The reader is referred to the April 16, 1992 SNPRM for more discussion of these lead time provisions.

A. Simple VOC Emissions Model

The simple model for VOC emissions is comprised of fuel specifications for RVP and oxygen. Fuels sold at retail outlets must have an RVP during the high ozone season (June 1 through September 15) of no more than 7.2 psi in VOC control region 1 (the southern areas typically covered by ASTM class B during the summer) and 8.1 psi in VOC control region 2 (the northern

areas typically covered by ASTM class C during the summer).<SUP>1 The differences in climate between these two types of areas requires a corresponding difference in gasoline volatility to achieve the same emissions effect. The period of June 1 through September 15 was chosen for the high ozone season because most of the ozone violations occur during this period. (See 56 FR 24242 for a discussion of the determination of this period.)

\1\Lower RVP limits apply for fuels that comply under averaging. RVP controls also apply from May 1 to May 31 for facilities upstream of retail outlets. These issues are discussed elsewhere in this proposal.

Section 211(k)(3) of the Act requires that at a minimum reformulated gasoline comply with the more stringent of either a 15% reduction in VOC emissions or a formula fuel described in that section, whichever is greater. EPA has determined that the formula fuel would achieve less than a 15% reduction in VOC. As such, the minimum VOC emission reduction required by the Act is 15%. As discussed in section IV, EPA believes that the VOC emission reduction in VOC control region 2 from a fuel with an RVP of 8.1 psi and 2.0 weight percent oxygen will be sufficient to achieve the minimum 15% VOC emission reduction relative to the Clean Air Act baseline gasoline (which has an RVP of 8.7 psi). In VOC control region 1, an 8.1 psi RVP fuel with 2.0 percent oxygen (which would meet the minimum 15% reduction requirement relative to the CAA baseline fuel) would actually have greater emissions than a fuel meeting EPA's Phase II RVP control standards for VOC control region 1 (maximum RVP of 7.8 psi). EPA believes that when Congress designated cities for inclusion in the reformulated gasoline program that it intended the program to provide emissions reductions in addition to those provided by the Phase II RVP requirements. If EPA merely required reformulated gasoline in VOC control region 1 to meet the RVP requirement for VOC control region 2, then no reduction in VOC emissions would

accrue under the first phase of the reformulated gasoline program beyond those mandated by Phase II RVP standards. EPA projects that relative to Phase II RVP control levels, a fuel with 7.2 psi RVP and 2.0 weight percent oxygen would provide VOC emission reductions in VOC control region 1 similar to those obtained in VOC control region 2.

While requiring reformulated gasoline sold in VOC control region 1 to have an RVP of no more than 7.2 psi goes beyond the minimum requirement stated in section 211(k)(3), section 211(k)(1) authorizes EPA to require emission reductions in VOC control region 1 of this magnitude because they are achievable considering costs, other air quality and non-air quality impacts, and the energy implications of such a requirement.

Similarly, EPA believes that additional VOC reductions are obtainable if refiners are allowed to meet the RVP and oxygen standards through averaging. If refiners wish to take advantage of averaging, EPA thus will require their average RVP for both VOC control regions 1 and 2 to be reduced by 0.1 psi to 7.1 and 8.0 psi, respectively, and the average oxygen concentration to be increased to 2.1 weight percent oxygen. For additional discussion of the rationale for the more stringent standard in VOC control region 1 and the increase in stringency of the averaging standards, the reader is referred to the April 16, 1992 SNPRM.

B. Simple NO<INF>x Emissions Model

The Clean Air Act requires that there be no NO<INF>X emissions increase from reformulated fuels. Based on data available during the regulatory negotiations and at the time of the April 16, 1992 proposal, it appeared that fuel oxygen content and the type of oxygenate used may have an impact on NO<INF>X emissions while no other simple model parameter appeared to have such an impact. Due to the statutory requirement for oxygenate use, and the lack of any other parameters in the simple model by which refiners could offset any NO<INF>X increase, EPA

needed to place restrictions on the amount of oxygen that could be added to the fuel in order to prevent NO<INF>X emission increases. EPA proposed on the basis of the data then available that MTBE blends containing up to 2.7 weight percent (wt%) oxygen and other blends containing up to 2.1 wt% oxygen would be presumed to result in no NO<INF>X increase. Greater oxygenate concentrations could not be permitted due to the risk of NO<INF>X emission increases. When additional data became available, however, there did not appear to be any significant difference between the NO<INF>X emission effects of oxygen from different oxygenates. Furthermore, it appeared that reducing the concentration of a number of additional fuel parameters (aromatics, olefins, sulfur, etc) could reduce NO<INF>X emissions. Since these fuel parameters all tend to be reduced to varying degrees when oxygenates are added to gasoline, EPA proposed in its February 26, 1993 proposal that all oxygenates be assumed to result in no NO<INF>X emission increase under the simple model up to 2.7 wt% oxygen.

Under the final Complex Model discussed in Section IV, oxygen has been found to result in no NO<INF>X increase, in fact, it results in a very slight decrease. However, the other changes that occur to the fuel when oxygenates are added both increase and decrease NO<INF>X emissions (increases in E200 increase NO<INF>X emissions while reductions in sulfur, olefins, aromatics, and increases in E300 reduce NO<INF>X emissions). Typically the effect of these other fuel changes will be to further reduce NO<INF>X emissions. However, there is no control placed on E200 levels under the simple model, and the levels of sulfur, olefins, an E300 are only constrained to the refiner's 1990 baseline levels (aromatics is controlled indirectly to some degree by the toxics requirement). As a result, there is no assurance under the simple model that oxygenate addition will not increase NO<INF>X emissions. The more oxygenate added, the greater the increase in E200, and the greater the possibility for a NO<INF>X increase. For this

reason EPA believes it is still appropriate to cap the maximum oxygen content under the Simple Model at 2.7 wt%. Any higher oxygen concentrations will require use of the complex model.

However, for a number of reasons, EPA believes it is appropriate for any oxygenate up to 3.5 weight percent oxygen to be presumed to result in no NO<INF>X emission increase under the simple model during those months without ozone violations (e.g., winter months) unless a state requests that oxygenate levels be limited to the 2.7 wt% oxygen level applicable during those months with ozone violations. First, although there are a number of concerns associated with NO<INF>X emissions, the main concern of focus in this rulemaking is ozone which is for the most part a summertime problem. Second, while there is no assurance that individual batches of gasoline containing more than 2.7 wt% oxygen will not increase NO<INF>X emissions, the increase, if any, would be small (i.e., likely less than 1 percent). Third, on average across all fuel produced by all refiners in an area, a NO<INF>X reduction may still occur. Fourth, there are benefits to the use of oxygenates during the winter months (lower CO and air toxics emissions) that may be more important to individual states than the certainty that no one batch of fuel increases NO<INF>X emissions relative to the 1990 baseline.

A state may make a request for the 2.7 wt% oxygen limit to apply during the non-ozone season when it believes that the use of higher oxygenate levels would interfere with attainment or maintenance of another ambient air quality standard (other than ozone) or another air quality problem. This proposal parallels the Regulatory Negotiation Agreement of August 16, 1991 and EPA's letter to the Renewable Fuels Association dated August 14, 1991.

C. Simple Toxics Emissions Model

Under section 211(k)(3), EPA must at a minimum require the more stringent of either a specified formula fuel or a 15 percent reduction in toxics emissions from that of baseline

gasoline. All five of the toxic air pollutants that section 211(k)(10) of the Act specifies for control through reformulated gasoline (benzene, 1,3-butadiene, polycyclic organic matter (POM), formaldehyde, and acetaldehyde) also fall under the category of VOCs. Exhaust emissions include unburned benzene and benzene formed from other aromatics during the combustion process. Benzene, an aromatic compound, is a natural component of gasoline and, as such, is present in evaporative, running loss and refueling emissions (nonexhaust emissions). However, nonexhaust VOC and benzene emissions data are only available in sufficient quantities under high ozone test conditions. Therefore, nonexhaust benzene emissions are not considered outside of the high ozone season. The four other toxic air pollutants subject to control by reformulated gasoline are not present in gasoline and hence are solely products of combustion.

The equations that represent the simple model for air toxics emissions are shown in section 80.42 of the regulations. The derivation and referenced work is given in the regulatory impact analysis. Only minor changes were made to the proposed simple toxics model. One change excluded ethane from the exhaust VOC baseline emissions as discussed below in Section III.D.3. The weight fractions of the various toxics as a function of VOC have also been adjusted accordingly, resulting in no net change in predicted toxics performance for a particular fuel. At the request of commenters, EPA has also included the oxygenates tertiary amyl methal ether (TAME) and ethyl tertiary amyl ether (ETAE) as well as provisions for other oxygenates and mixed oxygenates. Due to their similar chemical makeup, methyl ethers (such as TAME) and ethyl ethers (such as ETAE) are to be modeled using the same equations as for MTBE and as for ETBE, respectively. Higher alcohols will be modeled using the same equations as for ethanol. Higher ethers will be modeled as ETBE for all air toxics, since ETBE was the highest ether for which toxics data were available.

D. Baseline Determination

Where the performance standard is more stringent than the formula, the Act requires EPA to promulgate standards for the performance of reformulated gasoline that are relative to emission levels from baseline vehicles using baseline fuel. In order to determine whether fuels meet the performance requirements of reformulated gasoline under the simple model, EPA must therefore establish the baseline to which the emission performance of reformulated fuels are to be compared. The following discussion describes how EPA derived the emission baselines.

1. Control Periods

Before the emission baselines can be determined, the time frame over which fuel performance will be evaluated must be identified. Section 211(k) of the Act requires control of VOC emissions during the ``high ozone season.'' For the purposes of this rulemaking, the high ozone season is defined to be June 1 through September 15. This period covers the vast majority of days during which the national ambient air quality standard for ozone is exceeded nationwide and is consistent with the period covered by EPA's gasoline volatility control requirements. All gasoline at service stations must thus comply with the reformulated gasoline requirements during this period. Also in keeping with the gasoline volatility control rulemaking the ``VOC control Period'' for compliance with the reformulated gasoline provisions upstream from the service station (necessary to ensure complying fuel is available at the service stations during the high ozone season) is May 1 through September 15.

2. Baseline Gasoline

The fuels to be used in determining baseline emissions are unchanged from the February 26, 1993 proposal and are shown below.

Table III-1 --Baseline Fuel Compositions

	Summer	Winter
Sulfur, ppm	339	338
Benzene, volume percent	1.53	1.64
RVP, psi	8.7	11.5
Octane, R+M/2	87.3	88.2
T10, degrees F	128	112
T50, degrees F	218	200
T90, degrees F	330	333
Aromatics, volume percent	32.0	26.4
Olefins, volume percent	9.2	11.9
Saturates, volume percent	58.8	61.7

3. Definition of Ozone-Forming VOC

The Act requires reductions in emissions of ozone-forming VOCs. This interpretation is consistent with the focus of Section 211(k) on the areas with the most extreme ozone pollution problem. EPA proposed in April 16, 1992 that methane would be excluded from the definition of VOC on the basis of its low reactivity in keeping with past EPA actions, but included all other VOCs including ethane. EPA further proposed, however, that should the Agency modify the definition of VOC, we might do so for the reformulated gasoline rulemaking as well. As discussed in the February 26, 1993 proposal, EPA has also modified the definition of VOC to exclude ethane in a separate Agency rulemaking (57 FR 3941). As a result, the performance of fuels meeting the VOC emission requirements under the simple model are expressed on a nonmethane, non-ethane basis. This change resulted in slight changes to the simple model equations previously proposed, but the overall results of the simple model are essentially unaffected. 4. Simple Model Baseline

The following table shows the baseline emissions under the simple model which result from the assumptions discussed above. Since the MOBILE model does not estimate toxics emissions, however, separate data and information was necessary to determine their baseline emissions. The

toxics baseline was developed in essentially the same manner as that proposed in the April 16, 1992 proposal. An explanation of this derivation can be found in Section II of the RIA.

Table III-2 --Simple Model Baseline Emissions

	Summer		Winter
	Region 1	Region 2	
Exhaust VOCs (g/mi)	0.444	0.444	0.656
Non-Exhaust VOC (g/mi)	.856	.766	0
Total VOCs (g/mi)	1.30	1.21	0.656
Exhaust Benzene (mg/mi)	30.1	30.1	40.9
Evaporative Benzene	4.3	3.8	0.0
Running Loss Benzene	4.9	4.5	0.0
Refueling Benzene	0.4	0.4	0.0
1,3-Butadiene	2.5	2.5	3.6
Formaldehyde	5.6	5.6	5.6
Acetaldehyde	4.0	4.0	4.0
POMs	1.4	1.4	1.4
Total TAPs (mg/mi)	53.2	52.1	55.5

E. Phase I Performance Standards Under the Simple Model

Section 211(k)(3) directs EPA to require, at minimum, that Phase I reformulated gasoline comply with the more stringent of two alternative VOC and toxics emission requirements--either a performance standard of a 15 percent reduction from baseline levels on a mass basis, or compositional requirements specified as a formula in Section 211(k)(3)(A). The formula effectively defines a set of maximum or minimum fuel parameter specifications. In evaluating which requirement is more stringent, EPA is to consider VOC and toxics separately. The stringency of the formula is best evaluated by determining the emissions performance of the fuels that would be certifiable if EPA were to impose the requirements of Section 211(k)(3)(A). A gasoline would meet these requirements if it (1) had no more than 1.0 volume percent

benzene, (2) had no more than 25 volume percent aromatics, (3) had no less than 2.0 weight percent oxygen, and (4) met the requirements for detergent additives and lead content. The formula does not specify or limit any additional gasoline properties, and therefore a wide variety of fuels with very different properties would qualify as complying with the formula. For example, the formula specifies the weight percent oxygen but does not specify the type of oxygenate. If EPA were to impose the requirements of Section 211(k)(3)(A), then any approved oxygenate could be used to meet the formula's oxygen requirement, as long as it was blended to achieve the required weight percent oxygen. The same would be true of sulfur levels, distillation characteristics, olefin levels, RVP levels, and so on. As long as the formula's requirements were met, the fuel would be certifiable if EPA were to base its certification requirements on Section 211(k)(3)(A). To evaluate the emissions performance of the various fuels that would comply with the formula requirements, EPA used the Phase I complex model. Given the Phase I baseline emission levels, EPA considers the complex model to be the most appropriate means of evaluating emissions performance since it incorporates the Agency's most recent, complete, and accurate knowledge of the effects of fuel properties on VOC and toxics emissions. Since many of the fuel parameters that are not specified for the formula affect VOC and toxics emissions, the various possible formula fuels exhibit a wide variety of emission performance levels as these unspecified parameters vary. According to the Complex Model, requirements based on many possible formula fuels would be less stringent than requirements based on the 15 percent minimum reduction requirements of Section (211)(k)(3)(B). In addition, the lack of specificity of the formula fuel would make establishment of an equivalent emissions performance standard impossible, since one or more possible formula fuels would fail to meet any specific standard.

In past proposals, EPA has evaluated the formula fuel by assigning levels for unspecified

parameters at their level in baseline gasoline, as defined in section 211(k)(9)(B) of the Act. However, such an interpretation would not eliminate the problems described above, since the oxygenate type would remain unspecified. Hence the requirements of a formula could be met by a range of fuels, each based on different oxygenates, even if unspecified parameters were to be set to baseline levels, and this range of fuels would exhibit a range of emission performance levels. While the Complex Model attributes identical effects to oxygen in different chemical forms for most pollutants, it incorporates emission effects that depend on the type of oxygenate used for nonexhaust benzene, acetaldehyde, and formaldehyde emissions. EPA therefore ran the complex model for several fuels, varying the type of oxygenate and holding other parameters not specified by the formula at statutory baseline levels.

The VOC emission reductions from baseline levels for all such formula fuels were less than 15 percent. EPA therefore based the VOC emission requirements for Phase I reformulated gasoline on the 15 percent reduction minimum performance standard, since this standard is more stringent than the requirements of the formula. For toxics performance, EPA separately evaluated the emissions performance of fuels that met the formula requirements and contained statutory baseline levels of unspecified fuel properties for VOC control regions 1 and 2, since nonexhaust benzene emissions would differ in these two regions. EPA also evaluated such fuels with different oxygenate types. The results are shown in Table II-3. These results include both summer and winter effects, weighted based on the share of vehicle miles traveled in each season.

Table II-3 --Phase I Toxics Emissions Performance of Formula Fuels

Oxygenate type	Percent reduction from CAAB levels	
	VOC control	VOC control

	region 1	region 2
ETBE	11.82	11.65
Ethanol	13.16	13.01
MTBE	16.33	16.15
TAME	**16.81**	**16.67**

The results indicate that whether a formula fuel (with unspecified fuel parameters at statutory baseline levels) meets the 15% minimum performance requirement of section 211(k)(3)(B) depends on the type of oxygenate used. If EPA were to impose the formula requirements of section 211(k)(3)(A), the results presented in Table II-3 indicate that not all gasolines which could be certified as reformulated would achieve at least a 15 percent reduction in toxics mass emissions, even if unspecified fuel properties were set at statutory baseline levels. If EPA were to require a 15 percent emissions reduction in accordance with section 211(k)(3)(B), however, all fuels would achieve this minimum level of reductions. EPA therefore believes that the formula requirements of section 211(k)(3)(A) are not as stringent as the performance standard set forth in Section 211(k)(3)(B). The minimum performance standard for Phase II is even more stringent than the Phase I standards. EPA has therefore determined that the performance standard is more stringent than the formula for both VOCs and toxics, for both Phase I and Phase II. EPA must therefore set its Phase I requirements for both VOCs and toxics to be no less stringent than the 15 percent emission reduction performance standard required by section 211(k)(3)(B). EPA has considered whether it should require greater reductions in toxics mass emissions than that required by the 15 percent minimum performance standard. However, the Agency has concluded that more stringent toxics requirements are not costeffective, as is discussed more fully in Section VI. Hence EPA has set the Phase I toxic emission performance standard at the minimum 15 percent reduction from baseline levels required by the Act. Compliance with this standard must be demonstrated using the appropriate emission models

throughout Phase I.

Under the authority of section 211(k)(1), EPA believes that the greater flexibility and reduced cost afforded to gasoline refiners and importers by an averaging program allow EPA to require a greater reduction in toxics emissions than is required under section 211(k)(3). As discussed in Section VII, the Agency believes it appropriate, when the air toxics standard is met on average, that it be 1.5 percentage points more stringent than standards met on a per-gallon basis. EPA estimates that the approximate 1.5 percentage point margin will be sufficient to recoup any compliance margin refiners would have otherwise had to maintain to ensure achievement of the toxics requirements in the absence of an averaging program. In sum, the tighter averaged standard should have the potential to increase the environmental benefits of the reformulated gasoline program while not increasing the cost of obtaining those benefits. As a result, the air toxics performance standard when met on an annual average basis is set at a 16.5% reduction from baseline levels.

F. Applicability (1995-7)

The Simple Model described in this section is effective beginning January 1, 1995 with the beginning of the reformulated gasoline program as a means by which fuel producers can certify that their fuel meets the requirements for reformulated gasoline. The Complex Model described in Section IV will not be required to be used for fuel certification until January 1, 1998.

Until January 1, 1998, refiners who produce reformulated gasoline will have a choice of certifying their gasoline by using either the Simple Model or the Complex Model. EPA proposed three options for establishing the performance standards under early, optional use of the Complex Model. Under one option, if a refiner opts to utilize the Complex Model before January 1, 1998 the reformulated gasoline can have no worse VOC, NO<INF>X, or toxic emissions

performance than would be predicted by the Complex Model for a Simple-Model fuel (minimum 2.0 percent oxygen, maximum 1.0 percent benzene, and maximum RVP of 8.1 psi in Class C areas and 7.2 psi in Class B areas) having that refiner's average 1990 levels of sulfur, olefins, and T90 (E300). The second option was a variation of the first, in that refiners producing gasoline for use in only the southern reformulated gasoline areas (VOC control region 1) could measure their fuel performance against the CAA baseline gasoline as an alternative to their own 1990 refinery baseline. The third option, proposed by EPA in February 1993, would extend the second option to all reformulated gasoline areas. The rationales for these options are discussed in detail in EPA's proposals. Many of the comments were also received prior to the proposals, and as such were addressed there. As a result, the reader is referred back to the proposals for additional discussion. After considering the comments, EPA has decided to promulgate the first option. First, under this option each refiner will have to achieve the same reductions, whether they use the simple model or the complex model. The option to use either model increases refiner flexibility, but will not change the emissions reductions required for a refiner prior to mandatory use of the complex model in 1998. EPA believes that the reductions required under the simple model are achievable considering all relevant factors and will continue to be so under the optional use of the complex model. In fact, the additional flexibility of using the complex model would in some cases make them even more reasonable.

Second, the other two options create an incentive for early use of the complex model by those refiners who would then have a less stringent performance standard than under the simple model. This would produce on average an increase in overall emissions for reformulated gasoline compared to average emissions if only the simple model was allowed. Refiners with individual baselines for sulfur, T90 and olefins that are lower than the CAA baseline would, under the

second and third options, get credit for emission benefits for these parameters, and could use this to justify a less stringent RVP control than required under the simple model. There would be no parallel disincentive to early use of the complex model for refiners with higher baselines which would result in an increase in their required reductions. This imbalance in the expected early use of the complex model could easily lead to an average 1-2 percentage point reduction in the average emission performance of reformulated gasoline from 1995-7 as discussed in section I of the RIA. Based on this negative environmental impact, and the reasonableness of the complex model performance standard under the first option, EPA has decided to promulgate the first option described above for early use of the complex model.

G. Enforcement of the Early Use Option

Additional controls over reformulated gasoline certified using the ``early-use" complex model are necessary for the operation of the downstream enforcement mechanisms of VOC and NO<INF>X emissions performance minimums, and covered area gasoline quality surveys. These restrictions are necessary because under the restricted early-use approach being promulgated, VOC, toxics, and NO<INF>X percentage reductions are calculated from a baseline fuel using the refiner's 1990 baseline levels of sulfur, T-90, and olefins. As a result, the reformulated gasolines produced by different refiners (or in some cases, at different refineries) under this option will likely each meet different percentage reduction standards for VOC, toxics, and NO<INF>X. Therefore, the performance of a fungible mixture of complex model gasolines produced by different refiners at different refineries could not be predicted, nor could be evaluated \2\

\2\Beginning in 1998, certification of reformulated gasoline using the simple model will no longer be an option, and all reformulated gasoline will be certified using the complex model.

Also beginning in 1998, all refiners and importers will calculate emissions performance reductions from Clean Air Act average gasoline; individual refiner baselines will not be relevant to reformulated gasoline. As a result, the difficulties with downstream enforcement and surveys will be resolved.

In order for the per-gallon minimums for VOC and NO<INF>X emissions performance to be monitored by downstream regulated parties and enforced by EPA, the baseline for a given gasoline sample must be known. Without knowledge of the baseline, it is not possible to determine whether the fuel complies with the per-gallon minimums, since it will be different for each refinery. Similarly, in order for the gasoline quality surveys to function under early use of the complex model, the baseline from which to determine the emission performance for VOC, toxics, and NO<INF>X must be known. Without knowledge of the baseline, it is not possible to determine whether the complex model fuels in an area on average meet the per-gallon standards.

EPA received comments from two industry groups representing the refining industry on this issue. Both commenters stated that EPA should require that ``early-use'' complex model gasolines subject to different baselines be segregated through the gasoline distribution system. EPA is adopting this suggested approach as the best (and perhaps only) means of accommodating both the restricted early-use option and downstream enforcement of per-gallon minimums and gasoline quality surveys.

Under this approach, gasoline sampled at any point in the distribution system would have known values for VOC, toxics, and NO<INF>X emissions performance that meet the per-gallon and minimum standards. Today's rule requires that these values must be included in the product transfer documents for ``early-use'' complex model gasoline, to inform downstream parties and EPA of the relevant pergallon and minimum values.

Today's rule prohibits the commingling throughout the distribution system, including at retail outlets, of ``early-use'' complex model gasoline that is subject to different baselines. One commenter stated that the segregation of this gasoline should be through the terminal level only. EPA disagrees with this comment because segregation through the retail level also is necessary in order for gasoline quality surveys to function. Survey samples are taken at retail outlets, and the survey requires that the relevant per-gallon values for VOC, toxics, and NO<INF>X emissions performance must be known for each sample.

EPA realizes that restrictions on commingling of ``early-use'' complex model gasolines constitutes a significant constraint on the use of this option, because most gasoline used in the United States is transported as a fungible commodity. As a result, EPA anticipates that before 1998 the complex model will be used only in limited situations. This might occur where a refiner has a gasoline transportation system that is dedicated from the refinery through the retail level, or where the cost advantages of using the complex model are sufficiently large to offset the difficulties of segregation. In spite of these constraints, EPA sees no alternative to requiring segregation controls over ``early-use'' complex model gasoline.

IV. Complex Model

The complex model described in this section has undergone significant changes since it was first proposed in the February 1993 NPRM. These changes have been made in response to three key factors: EPA's improved understanding of the relationship between fuel characteristics and emissions, EPA's use of more appropriate data analysis methods, and comments received in response to the February NPRM, a public workshop held on May 25, 1993, and EPA's July 14, 1993 docket submission that described a number of alternative complex models. The key elements in the complex model being promulgated today are discussed in this section. This

discussion also addresses the major substantive comments received by EPA regarding the complex model. A more detailed description of the model and its derivation, including a detailed summary and analysis of comments, can be found in Section IV of the RIA.

Baseline Emissions

As discussed in Section III, EPA is using a July 11, 1991 version of MOBILE4.1 to estimate baseline emissions from light-duty vehicles for the simple model, assuming a basic inspection and maintenance program. This baseline was developed in the regulatory negotiation and was at the time the best estimate of the in-use emission performance of 1990 vehicles from which to ensure that the minimum performance standards required by section 211(k) of the Clean Air Act would be achieved.

Since that time the Agency has developed a new version of the MOBILE model, MOBILE5a, for use by the states in demonstrating compliance with the national ambient air quality standard for ozone. As proposed in the February 26, 1993 proposal, EPA will use MOBILE5a in conjunction with an enhanced I/M program to establish the emission baseline for Phase II of the reformulated gasoline program beginning in the year 2000. EPA, however, has decided to retain the MOBILE4.1 and basic I/M baseline assumption for the simple model during Phase I of the RFG program. Switching to a MOBILE5a baseline for Phase I would have required reformulated fuels to meet a slightly more stringent RVP standard to maintain the minimum VOC emissions performance required by the Act. The majority of the VOC emission reductions achieved by RFG are from nonexhaust emissions; under MOBILE5a, nonexhaust VOC emission reductions are less effective in reducing overall VOC emissions than are exhaust VOC reductions, while the opposite is true under MOBILE4.1. Thus, in order to provide refiners with sufficient leadtime to complete the investments needed to meet the requirements of the program, the baseline for the

Simple Model is determined using MOBILE4.1. When replacement of the Simple Model with the Complex Model is required in 1998, the issue again arises as to whether a more stringent standard should be required by shifting to use of MOBILE5a in determining the baseline. MOBILE5a clearly provides a more recent estimate of the mobile source VOC inventory than does MOBILE4.1. However, many of the changes made in MOBILE5a were intended to significantly increase the accuracy of the exhaust emission estimates while similar changes which would have increased the accuracy of the nonexhaust VOC emission estimate were not incorporated for various reasons, including the limited time available to revise the MOBILE model. As a result, the proportional contribution of exhaust and nonexhaust VOC emissions to the in-use VOC inventory may not be any more accurate in MOBILE5a than in MOBILE4.1 even though MOBILE5a provides a more accurate assessment of the total contribution of mobile sources to the entire VOC inventory by virtue of its greater accuracy in estimating exhaust VOC emissions. Since it is the relative proportions of exhaust and nonexhaust VOC emissions and not the overall magnitude of the mobile source VOC inventory which determines how difficult it will be for refiners to meet the overall VOC standard in 1998, it is unclear whether MOBILE5a would be more appropriate to use in 1998 than MOBILE4.1.

A simple model fuel evaluated using the complex model achieves more than the minimum 15% requirement of the Act using the MOBILE4.1 baseline exhaust/nonexhaust ratio but less than the 15% requirement using the MOBILE5a baseline exhaust/nonexhaust ratio. Given the uncertainty in the actual in-use exhaust/nonexhaust ratio during this interim period, it is difficult to know whether or not the 15% actually would be achieved in-use by a fuel meeting the requirements of the Simple Model. Using MOBILE4.1 to determine the baseline in 1998 would introduce some risk that the 15% minimum performance requirement of the Act would not be

met in-use by a fuel meeting the requirements of the Simple Model. However, this risk is relatively small in magnitude (less than three percentage points of emission reduction are at stake) and duration (the risk exists for only two years). On the other hand, using MOBILE5a to determine the 1998 baseline would result in some risk that refiners would be required to incur greater costs to achieve a more stringent standard than the minimum required by the Act. This greater stringency would have the effect of creating a third interim phase to the RFG program.

Given the uncertainty in determining whether a MOBILE4.1-based performance standard or a MOBILE5a-based standard more accurately reflects the in-use conditions in 1998, the potential disruption to refinery operations (even if only for a small increase in the stringency of the fuel reformulation requirements), the fact that a more stringent standard in 1998 was not discussed or envisioned as part of the regulatory negotiation process, and the fact that any risk to the environment is small and of short duration, EPA does not believe it to be appropriate to base the Phase I complex model standards on MOBILE5a and require refiners to meet a more stringent performance standard in 1998. As a result, EPA will retain MOBILE4.1 with basic I/M as the basis for the Phase I performance standards under the Complex Model in 1998.

In summary, EPA has retained the VOC and NO<INF>X baselines proposed in the SNPRM, including the relevant I/M assumptions, for use with the complex model prior to 2000. The onset of the Phase II performance standards in 2000 will increase the overall stringency of the standards, and a new baseline based on MOBILE5A will not, by itself, be the cause of new investment by refiners. By this time, enhanced I/M programs should be fully operational in nearly all reformulated gasoline areas. Therefore, baseline VOC and NO<INF>X emission levels to be used with the complex model in Phase II are based on MOBILE5A's estimate of emissions from light-duty vehicles and trucks with enhanced I/M.

Baseline estimates of toxics emissions are not available directly from the MOBILE models. The nonexhaust toxics model bases its estimates of nonexhaust toxics on the RVP and benzene levels of the fuel. Since both of these levels are specified for Clean Air Act baseline (CAAB) gasoline, EPA has used the nonexhaust toxics model to determine the baseline nonexhaust toxics emission level. The exhaust toxics baseline has been estimated by multiplying the exhaust toxics emission level predicted by the complex model for CAAB gasoline by the ratio of baseline exhaust VOC emissions to the average exhaust VOC emission measurement in the complex model database. Since the five regulated exhaust toxic pollutants are all classified as VOCs, this adjustment sets the baseline exhaust toxics level equal to the exhaust toxics levels that would have been observed if the vehicles represented by the complex model database had VOC emission levels representative of in-use vehicles when tested on CAAB gasoline. No comments were received opposing this approach, which is discussed in more detail in Section III of the RIA.

In evaluating the performance of simple model fuels, EPA has focused its attention on the average refiner. The need to compensate for differences between individual refinery baselines and the Clean Air Act baseline when the use of the complex model becomes mandatory has been communicated in past proposals, workshops, and the discussions associated with the Agreement in Principle. Hence refiners have been given adequate notice that if their baseline fuel produces higher emissions than CAAB fuel, then they must offset such emissions when the use of the complex model becomes mandatory in 1998. The four years before use of the complex model becomes mandatory is adequate leadtime for refiners. Refiners undertaking investments to comply with the simple model requirements have been made aware of these requirements, and this transition process was inherent in the regulatory negotiation agreement and in prior proposals. EPA recognizes that the precise emissions impact of individual refiner baselines could

not be determined with confidence until the Complex Model was promulgated. However, refiners were aware of at least one course of action that would satisfy the requirements of the program under the complex model, namely to alter their baseline fuel to match the Clean Air Act baseline prior to meeting the simple model requirements. Baseline emissions of VOC, NO<INF>x, and toxics are given in Table IV-1 for Phase I and in Table IV-2 for Phase II. Summer and winter baselines are shown for both phases, with summer baseline emissions for VOC Control Regions 1 and 2 shown separately. The toxics emission baseline shown in Table IV-1 is applicable only during 1998 and 1999 and for those refiners choosing to use the complex model prior to 1998; the baselines shown in Table IV-2 are applicable in 2000 and beyond.

Table IV-1 --Phase I Baseline Emissions, Milligrams/Mile

Pollutant	Summer		Winter
	Region 1	Region 2	
Running loss VOC	430.77	390.42	0.00
Hot soak VOC	264.61	229.96	0.00
Diurnal VOC	125.09	108.71	0.00
Refueling VOC	40.01	40.01	0.00
Nonexhaust VOC	860.48	769.10	0.00
Exhaust VOC	446.00	446.00	660.00
Total VOC	1306.48	1215.10	660.00
NO<INF>x	660.00	660.00	750.00
Running loss benzene	4.92	4.46	0.00
Hot soak benzene	3.02	2.63	0.00
Diurnal benzene	1.30	1.13	0.00
Refueling benzene	0.42	0.42	0.00

Nonexhaust toxics 9.66 8.63 0.00 Exhaust benzene

26.10 26.10 37.57 Acetaldehyde..... 2.19 2.19 3.57

Formaldehyde..... 4.85 4.85 7.73 1,3-butadiene..... 4.31

4.31 7.27 POM..... 1.50 1.50 2.21

Exhaust toxics 38.95 38.95 58.36 Total toxics 48.61

47.58 58.36

Table IV-1 --Phase II Baseline Emissions, Milligrams/Mile

Summer

Pollutant ----------

Region 1 Region 2 Winter

Running loss VOC 328.53 294.15 0.00 Hot soak VOC

84.11 80.97 0.00 Diurnal VOC..... 93.34 63.62 0.00 Refueling

VOC 53.33 53.33 0.00 Nonexhaust VOC 559.31

492.07 0.00 Exhaust VOC..... 907.00 907.00 1341.00 Total

VOC..... 1306.48 1215.10 1341.00 NO<INF>X.....

1340.00 1340.00 1540.00 Running loss benzene..... 3.75 3.36 0.00

Hot soak benzene..... 0.96 0.93 0.00 Diurnal benzene..... 0.97

0.66 0.00 Refueling benzene 0.56 0.56 0.00 Nonexhaust

toxics..... 6.24 5.51 0.00 Exhaust benzene..... 53.54 53.54

77.62 Acetaldehyde..... 4.44 4.44 7.25 Formaldehyde.....

9.70 9.70 15.34 1,3-butadiene..... 9.38 9.38 15.84

POM..... 3.04 3.04 4.50

Exhaust toxics	80.10	80.10	120.55	Total toxics	86.34
85.61	120.55				

Exhaust Emissions Model

1. Data Sources

The relationship between fuel properties and exhaust emissions is complex and the theory behind such relationships continues to be developed. As a result, EPA has asked industry, state regulatory agencies, and other organizations with relevant test data to make their data available to the Agency to ensure that this rule is based on as much relevant information as possible. The complex model described in the following section is based on data generated from a number of exhaust emissions testing programs. These programs, their design intent, and their limitations are discussed in Section IV.A of the RIA. Data from these programs were excluded from EPA's analysis if the data were not based on a valid FTP measurement cycle, if the vehicle in question did not employ 1990-equivalent emission control technology, if the vehicles did not exhibit stable, repeatable emissions performance, or if the data were clearly inconsistent with the bulk of the data available to EPA (based on statistical considerations). In addition, data from programs that did not measure nonmethane hydrocarbon emissions were not used to develop EPA's exhaust VOC complex model. The Agency believes its analysis considered all valid, and relevant data on the exhaust emissions effect of fuel modifications when used in 1990 model year and equivalent vehicles that was available at the time the model was developed.

2. Analysis Method

Exhaust emissions are affected by both vehicle and fuel characteristics. Since the test programs described above generally involved different vehicles, different fuels, and in some

cases different test procedures, the analysis required to determine the relationship between fuel properties and emissions is complex. However, EPA believes that the methods used to develop the complex model considers and addresses these complexities appropriately. EPA utilized statistical analysis techniques to isolate the effects of fuel modifications on exhaust emissions of VOC, NO<INF>X, and toxics from other factors affecting exhaust emissions. At a series of six public workshops held over the past two years, the Agency presented its views on data sources, analysis methods, and preliminary emissions models for public review and comment. The Agency also requested other organizations to share their data, analysis expertise, and emissions models at these workshops. The methods used to develop the model promulgated today appropriately incorporate the comments and suggestions regarding the analysis process received at the workshops, as well as other comments and suggestions received from industry, state and federal government authorities, and other interested parties during the course of this rulemaking. Information regarding the workshops, public comments and suggestions, and EPA's analysis methods can be found in Docket A-92-12. The approach chosen by EPA to analyze the available data is summarized below and is discussed more fully in Section IV.A of the RIA. Since the vehicle and the fuel both affect exhaust emissions, EPA's analysis separated exhaust emissions into fuel components and vehicle components. In all test programs analyzed by EPA, the single most significant determinant of the level of emissions from a given vehicle on a given fuel was the vehicle itself. Fuel properties exert a much smaller influence on exhaust emissions than do vehicle characteristics such as emission control system technology, vehicle mileage, catalyst efficiency, oxygen sensor efficiency, engine size, engine design, vehicle size, fuel efficiency, vehicle maintenance, etc. To identify the effects of fuel property modifications on emissions, EPA found it necessary to identify the effect of each vehicle on emissions and

separate this effect from the fuel effects. For vehicles used in more than one test program, EPA found it necessary to determine the vehicle effect separately for each test program since vehicle effects were observed to change between studies.

The fuel components of exhaust emissions were separated into two main categories. The first category consisted of the effects of individual fuel parameters. For example, the effect of sulfur on NO<INF>X emissions was best modeled by a relationship containing a linear sulfur term (of the form c<INF>1S, where c<INF>1 is a constant and S is the sulfur level) and a second-order sulfur term (of the form c<INF>2S<SUP>2, where c<INF>2 is a constant). The second category of fuel terms consisted of interactive effects between two fuel parameters. For example, EPA's analysis found that the effect of aromatics on hydrocarbon emissions is related to the E300 level of the fuel. This effect cannot be represented as an aromatics or E300 effect alone but must be represented as an interactive term of the form c<INF>3AE, where c<INF>3 is a constant, A is the aromatics level, and E is the E300 level.

In the February 1993 proposal, EPA indicated that it planned to make several changes to the method used to develop the complex model. As discussed in that proposal and in the RIA, fuels can be characterized in terms of a number of different sets of fuel parameters. EPA used the results of individual fuel studies and its public workshops to select the set of fuel parameters used to model exhaust emissions in its February 1993 proposal. At that time, the Agency indicated that it might alter its choice of parameters to represent gasoline distillation characteristics from a temperature basis (using T50 and T90) to a percent evaporated basis (using E200 and E300, the percentage of the fuel's volume that evaporates when heated to 200 deg.F and 300 deg.F, respectively). For reasons outlined in the February 1993 NPRM and section IV.A of the RIA, EPA has chosen to make this change and has converted its exhaust

emission models to a percent evaporated basis since the NPRM was issued, removing the T50 and T90 terms from its models in the process. The Auto/Oil Heavy Hydrocarbon and EPA Phase II Reformulated Gasoline Test Program studies have been added to the complex model database. Finally, EPA has changed the confidence level required to permit terms to remain in the model to 90 percent, in keeping with the approach used in developing the simple model. The Agency was not able to determine the influence of the type of aromatic compounds in fuels, specifically heavy aromatics, on exhaust emissions, and hence such terms have not been included in the complex model at this time.

Because vehicles can have different emission control systems, the Agency anticipated that fuel modifications would have different emission effects on different types of cars. To account for these differences, EPA's February 1993 proposal divided vehicles into two ``emitter classes" (normal and higher emitters) based on their exhaust emission levels. EPA then subdivided vehicles in each emitter class into ``technology groups" based on the emission control technology with which each vehicle was equipped. However, as discussed in the NPRM, EPA was concerned that technology group distinctions among higher emitters might not be appropriate, since such vehicles' high level of emissions indicated that their emission control systems were not functioning properly. In addition, the limited quantity of data for higher emitters made it difficult to identify genuine differences in emissions response between higher emitters of different technology groups. Many commenters expressed similar concerns. Hence the model promulgated today does not divide higher emitters into technology group categories but retains such distinctions when analyzing normal emitters. In response to numerous comments, EPA attempted to reduce the number of normal emitter technology groups. However, as discussed in section IV.A of the RIA, EPA was unable to identify an appropriate basis for

consolidation. EPA considers its retention of emitter class and technology group distinctions to be justified by the presence of statistically significant fuel effects specific to individual emitter classes and technology groups in today's complex model. At the same time, EPA recognized the validity of comments received from a number of sources that (1) many emission effects were likely to be consistent across multiple technology groups or across emitter classes, and (2) insufficient data were available to model many potential terms, particularly interactive terms. The approach used by EPA to construct the complex model proposed in February 1993 did not incorporate these legitimate concerns. To do so, EPA has utilized a modified version of the ``unified" approach advocated by API and other commenters (as described in the RIA) to develop today's complex model. This modeling approach, the statistical criteria used by EPA in conjunction with this approach, and the techniques used to simplify the models are discussed in detail in section IV.A of the RIA and are summarized below.

First, interactive terms were permitted to enter the models only when sufficient data were available. The model proposed in the February 1993 NPRM permitted all interactive terms to enter the models, regardless of whether sufficient data were available to estimate such an effect, and it did not apply statistical criteria to evaluate whether terms added to the model introduced more risk of inaccuracy in the model than they removed.

Second, preliminary models for higher emitting vehicles were constructed based solely on data from such vehicles. Only those terms that satisfied EPA's statistical criteria (discussed at length in the RIA) were retained. These criteria included measures to balance overfitting (introducing too many terms to explain the observed data) and underfitting (not including terms necessary to explain the observed data). The NPRM model did not include measures to prevent overfitting. Third, the entire database was analyzed using the unified approach. The effects of

each term on emissions was divided into two parts: an average effect across all vehicles, and a series of adjustment terms for each technology group and for higher emitters. Only those terms that satisfied EPA's statistical criteria were retained, with two exceptions. Higher emitter adjustment terms were retained regardless of statistical significance since they had been found to be statistically significant when examining the higher emitter data separately. EPA was concerned that failure to do so might cause genuine higher emitter effects to be ``washed out" by the greater number of data for normal emitters. In addition, some overall terms were retained for hierarchy reasons despite low statistical significance. For example, a linear term for a given fuel parameter (e.g., E300) might not be significant while a squared term for the same parameter (e.g., E300\2\) might be significant. Since the mathematical form of the squared terms includes the corresponding linear effects, the linear term would be retained regardless of significance to preserve the model's hierarchical structure. The importance of hierarchy was emphasized by a number of workshop participants and commenters, as discussed in the RIA. The NPRM model included separate terms for each technology group and emitter class and hence did not include terms to represent the average effect of a fuel parameter across all vehicles. The NPRM model also did not incorporate hierarchy considerations.

Fourth, outlying and overly influential data were dropped from the database and the model was re-estimated based on the remaining data. Outlying data consist of observations that differ from the average observed effect by so large a margin that they are more likely to represent observational error, reporting error, or other measurement artifacts than genuine phenomena. Outlying data can obscure genuine emissions effects. Influential data consist of observations that by themselves materially affect the resulting model, i.e., the model would differ materially if they were excluded. In a database the size of the Complex Model database, individual data

points should not have such unusually large effects. Excluding outlying and influential observations is standard statistical practice. The NPRM model did not exclude either type of observation.

Fifth, terms were deleted from the resulting model to avoid overfitting and collinearity problems. Overfitting occurs when so many terms are included in a regression model that the expected error due to the erroneous inclusion of a term exceeds the expected error due to not including the term. Collinearity problems occur when the fuel parameters included in the model are correlated with one another in the fuels tested. For example, the addition of oxygenate to gasoline causes E200 to increase. The oxygenate-containing fuels in the complex model database tend to have higher E200 values than fuels without oxygenate. In a sense, one can predict the E200 value of a fuel by knowing its oxygen content. Hence these two parameters would be considered to be highly collinear. Since regression models are developed under the assumption that terms are not collinear, the presence of strong collinearities can introduce error into the regression. Today's complex model takes both collinearity and overfitting into account by using a standard statistical criterion called Mallow's C<INF>p criterion to remove terms which introduce large overfitting and collinearity problems. This approach resulted in a simpler, more reasonable, and statistically more sound model than had been proposed in the February 1993 NPRM. It should be noted that high emitter terms forced into the model earlier in the process could be dropped at this stage of the analysis. Measures were taken to limit collinearity problems in the NPRM model, but overfitting concerns and the C<INF>p criterion were not addressed.

Sixth, the contribution of each remaining term to the model's explanatory power was estimated, and those terms whose contribution summed to less than one percent were deleted (i.e., the retained terms accounted for 99 percent of the explanatory power of the model) to simplify the form of the model without materially reducing its ability to predict the emissions

impact of fuel modifications. This step was not taken during development of the NPRM model. Finally, the resulting models for each technology group within the set of normal emitting vehicles were consolidated into a single equation using a random balance approximation. The details of that approximation are given in Section IV.A of the RIA. This step was not taken during development of the NPRM model. The results of EPA's modeling efforts confirms the importance of technology group and emitter class distinctions, as can be seen by examining the differences in the exhaust emission equations for specific normal emitter technology groups or for normal and higher emitter class categories (as discussed in greater detail in the RIA). Efforts to reduce the number of technology group categories for normal emitters were not successful. Efforts to subdivide higher emitters by their emission characteristics such as exhaust hydrocarbon to NO<INF>X ratio did not improve the quality of EPA's higher emitter model. However, as discussed above, EPA found it unnecessary to separate higher emitters by technology group. This modification reflects EPA's belief, supported by preliminary field information, that one or more emission control components on higher emitters tend to be malfunctioning, which renders a classification scheme based on vehicle equipment questionable.

3. Exhaust Model

As was discussed in the April 1992 and February 1993 proposals, the weight assigned to each technology group or emitter class for modeling purposes was set equal to its contribution to in-use emissions for each pollutant. The weight assigned to each emitter class was set equal to its projected contribution to in-use emissions. The weighting factor assigned to normal emitters was then broken down further by technology group, again according to their projected contribution to in-use emissions. These estimates and projections are essentially unchanged from the February

1993 proposal, although minor changes have been made to reflect more complete information about the fraction of 1990 sales accounted for by each technology group. The rationale for, derivation of, and renormalization of the weighting factors themselves are discussed in more detail in the RIA.

Various commenters indicated that they considered EPA's previously proposed models were too complex. In response, the Agency has modified its analysis method in several ways. The resulting method, described in Section IV.B.2, results in exhaust emission models containing two equations for each pollutant instead of as many as sixteen separate equations, as was the case for the model proposed in February 1993. Each equation also has far fewer terms than the February 1993 equations. However, EPA does not believe that today's less complicated complex model is less accurate than the complex models presented at public workshops or in the February proposal. This belief is based on the models' comparable explanatory power (as reflected in their similar R\2\) and the superior accuracy of today's model in accounting for the emission effects seen in the vehicle testing programs that comprise the complex model database. Today's VOC and NO<INF>X models are based on the most accurate of the three sets of models included in EPA's July 14, 1993 docket submittal, while also taking into account relevant comments regarding specific aspects of the models. Today's toxics models are a further simplification of the models included in the July 1993 docket submittal in response to comments received by EPA on its docket submittal. These points are discussed more fully in Section IV.A of the RIA.

The specific equations that comprise the complex model can be found in section 80.45 of the regulations for this rule. Their derivation is discussed in detail in Section IV.A of the RIA. The range of parameter values for which these equations are valid is discussed in Section D and in Section IV.D of the RIA. As discussed in Section V, refiners are required to submit data to

augment the model if they wish to certify fuels with properties that fall outside this range as reformulated gasolines.

C. Nonexhaust Model

Nonexhaust emissions are less strongly affected by vehicle design and are influenced by fewer fuel characteristics than are exhaust emissions. In addition, the theoretical principles involved in nonexhaust emissions (which include evaporative, running loss, and refueling emissions) are better understood, and nonexhaust emission control technologies are more consistent across vehicles, than are exhaust emissions and emission control technologies. Since the relationship between fuel properties and nonexhaust emissions is less complex and better understood than for exhaust emissions, there was much less need for EPA to generate additional data to evaluate nonexhaust emissions than was the case for exhaust emissions. EPA was able to base its nonexhaust VOC emission model on data generated from EPA's ongoing nonexhaust emissions testing program that has been used to develop EPA's MOBILE emission inventory models, specifically the MOBILE4.1 and MOBILE5.0A models. EPA believes this data to be sufficient to model the relationship between fuel properties and nonexhaust VOC emissions for the purposes of this rule. Additional information about MOBIL4.1 and MOBILE5.0A can be found in Dockets A-91- 02 and A-92-12.

EPA is in the process of developing an enhanced model of nonexhaust VOC emissions, based on a more complete set of theoretical principles and additional test data, that is expected to be more accurate and more widely applicable to oxygenated fuels than the MOBILE models. A preliminary version of this model was discussed at a public workshop held on August 25, 1992, and materials related to this model have been placed in the docket for this rulemaking. At this time, however, this enhanced nonexhaust VOC emissions model is not complete and hence is not

incorporated in today's complex model. The nonexhaust VOC model in today's complex model is based on correlations between RVP and nonexhaust VOC emissions derived from the July 11, 1991 version of MOBILE4.1 for Phase I of the reformulated gasoline program (1995-1999) and from MOBILE5A for Phase II (2000 and beyond). This approach is consistent with the definition of baseline emissions set forth in Section IV.A and is based on the same considerations outlined in that section. To develop the correlations shown below, the MOBILE models were used with temperatures of 69 to 94 degrees Fahrenheit for Class B areas and 72 to 92 degrees Fahrenheit for Class C areas. As discussed in Section IV.A, a basic inspection and maintenance program was assumed for Phase I while an enhanced I/M program was assumed for Phase II. In addition, the presence of Stage II evaporative emissions recovery systems with an overall vapor recovery efficiency of 86 percent was assumed (as discussed in the SNPRM and NPRM). EPA is in the process of promulgating requirements for onboard refueling emission controls which may be more effective at controlling refueling emissions than Stage II vapor recovery systems. However, these requirements did not apply to 1990 model year vehicles and hence cannot be incorporated into the model for certification purposes. In addition, EPA has chosen not to incorporate the effects of onboard refueling controls in its evaluation of the effects of reformulated fuels on emissions from the entire inuse vehicle fleet, which includes vehicles from a number of different model years. This decision was made for several reasons. First, requirements for onboard refueling controls have not yet been finalized, making evaluation of their impact on in-use emissions difficult. Second, onboard refueling controls are not expected to be required on all new vehicles until 2000 and are not expected to be present on the bulk of in-use vehicles for several years after that time. Third, while onboard controls are expected to be more efficient at controlling refueling emissions than Stage II controls, the difference is not

expected to be large in areas affected by the reformulated gasoline program and will affect only a small portion of total nonexhaust VOC emissions. Since EPA's analysis of the additional benefits of onboard vapor recovery controls is not yet available, and since such benefits are expected to be small relative to overall emissions, EPA has chosen to retain its assumptions regarding Stage II vapor recovery in forecasting the effects of fuel modifications on nonexhaust VOC emissions from the in-use vehicle fleet. The only toxic air pollutant covered by the reformulated gasoline program that is found in nonexhaust emissions is benzene, which is a natural component of gasoline. The other four toxic air pollutants listed in section 211(k) are solely products of fuel combustion and hence are not found nonexhaust emissions. As discussed in the SNPRM, the Agency's correlation between fuel benzene content and summer nonexhaust benzene emissions is based on results from General Motors' proprietary model of tank vapors, as confirmed independently by EPAgenerated data using a number of fuels. Both the derivation and verification of the non-exhaust benzene emissions model are discussed more fully in the RIA. The nonexhaust benzene emission model also depends on the RVP of the fuel, as is the case for the nonexhaust VOC emission model. The derivation of the nonexhaust benzene and VOC models is discussed more fully in the RIA.

D. Range/Extrapolation

Like all regression models, the complex model is not valid for all possible input values. The range of fuel parameter values over which the complex model accurately predicts vehicle emissions is given in Table IV-3. These ranges are based on the range of data used to develop the models and on comments received by the Agency on this issue. The limits proposed in the February 1993 were, in some cases, narrower than the range of data used to develop the complex model. In addition, the limits proposed in the NPRM would have prevented a number of very

low emitting fuels from being certified using the model.

Table IV-3 --Parameter Ranges for Which the Complex Model Can Be Used

Fuel Parameter	Valid range for: Reformulated fuel	Conventional fuel
Aromatics, vol %	0-50	0-55
E200, %		30-70
E300, %	70-100	70-100
Olefins, vol %	0-25	0-30
Oxygen, vol %	0-3.7	0-3.7
RVP, psi	6.4-10	6.4-11
Sulfur, ppm		0-500
0-1000		
Benzene, vol %	0-2.0	0-4.9

EPA has received a number of comments requesting alterations in the model's range. After considering these comments and re-evaluating the data on which the complex model is based, EPA has modified the range limits. In some cases, EPA has chosen to extrapolate the complex model slightly beyond the range for which data were available in order to allow additional fuels, both conventional and reformulated, to be evaluated using the model without recourse to expensive and timeconsuming vehicle testing. These extrapolations are limited to those parameters whose effects appear to be well-characterized by the complex model. A detailed discussion of the limits of the available data, EPA's rationale for extending the valid range of the model for some parameters, and the extrapolation method used to extend the model can be found in Section IV.D of the RIA.

E. Winter

While the VOC performance standard for reformulated fuels applies only in the summer, the toxics and no-NO<INF>x-increase requirements apply year-round. EPA therefore recognized the

need to model the exhaust toxics and NO<INF>x emissions performance of reformulated gasolines during the winter months as well as during the high ozone season. Modeling winter emissions performance, however, presented a number of difficulties. First, the data sources described earlier provided data on emissions performance only under summer conditions and for gasolines with RVP levels typical of summer gasolines. Second, the RVP levels of fuels included in the complex model database ranged from 7 to 10 psi, while winter fuels tend to have RVP levels in the 11.5 psi range and are not restricted by other regulations. Hence the complex model cannot be used directly for fuels with typical winter RVP levels. RVP's impact on canister loading and subsequent purging is thought to be the primary cause of its effects on exhaust emissions. Since data do not exist on the effects of winter fuels on canister loading under winter conditions, the Agency is not able at this time to model the effects of winter RVP levels on exhaust emissions. To avoid making unsound or speculative predictions, EPA proposed and is now promulgating a requirement that for purposes of evaluating emissions effects using the complex model, the RVP of winter fuels be set at the summer statutory baseline RVP value. In effect, this requirement builds into the model the assumption that the RVP level of winter gasolines has no effect on NO<INF>x or exhaust toxics emissions. As a result, refiners will not be required to alter the RVP levels of winter gasolines. Refiners will receive neither benefit nor penalty for changing the RVP of their winter gasolines. To evaluate winter fuels using the complex model, an RVP value equal to that of summer baseline gasoline (8.7 psi) must be used instead of the fuel's actual RVP. Doing so effectively removes the contribution of RVP to winter exhaust emissions.

When sufficient data is developed on the emissions impact of winter RVP levels under winter ambient conditions, EPA will be able to revise the complex model accordingly. Until then, EPA

believes it is more appropriate to assume that RVP levels have winter exhaust emission effects than to speculate about the magnitude of such impacts. In its prior proposals, EPA had proposed that winter nonexhaust emissions, including winter nonexhaust benzene emissions, be considered zero. EPA received a number of comments requesting that both baseline emissions and the nonexhaust toxics model include winter nonexhaust benzene emissions. This request was based on the belief that the yearround benzene limits would result in reduced nonexhaust benzene emissions in the winter months. EPA has evaluated this claim, taking into account temperature ranges and the effects of inspection and maintenance programs on such emissions. EPA acknowledges the validity of this claim, since winter nonexhaust emissions, including nonexhaust benzene emissions, are likely to be nonzero under all winter temperature ranges. In the past, the lack of sufficient data on nonexhaust emissions under winter temperature conditions has prevented EPA from developing reliable, accurate models of winter nonexhaust emissions. The commenters provided a limited quantity of data on winter nonexhaust emissions to support their claim. However, the data submitted in support of this claim were based on measurements of nonexhaust emissions from vehicles with very low nonexhaust emissions. EPA's analysis indicates that these vehicles are not representative of in-use vehicles. In addition, the chemical composition of the measured nonexhaust emissions were characteristic of resting losses (losses that occur due to permeation through fuel system components) rather than of diurnal, hot soak, or running loss emissions. Resting losses are not included in EPA's baseline emission estimates, so EPA does not consider it appropriate to include resting losses in its nonexhaust emission models. Finally, no data were submitted on nonexhaust benzene emissions from fail vehicles under winter conditions. Since nonexhaust benzene emissions from such vehicles will comprise a significant portion of winter nonexhaust benzene emissions, EPA is concerned that a model

based on the submitted data would not provide accurate estimates of such emissions. Given the theoretical merits of the claim, however, EPA will consider including a model of winter benzene nonexhaust emissions in the complex model in the future when sufficient data become available.

F. Fungibility

EPA has long recognized the importance of maintaining a fungible fuel system, in which complying gasolines can be mixed freely without resulting in mixtures that do not themselves comply with regulatory requirements. Fungibility is essential to smooth, cost-effective operation of fuel distribution systems such as pipelines. The Agency has received numerous comments on the need to maintain fungibility. At the same time, the Agency considers it essential that gasolines certified as reformulated meet all required emission performance levels in the field. In cases where the effects of a given fuel parameter on emissions are non-linear, it is possible for two complying fuels to produce a non-complying fuel when mixed. The complex model contains a number of nonlinear terms, which introduces the possibility that gasolines which comply with this rule's requirements in isolation would not comply if mixed with other complying fuels. EPA has been concerned with this possibility and has undertaken extensive analyses to determine its likelihood and to develop methods to cope with its occurrence. EPA's analyses, which have utilized methods that have been supported by a number of organizations, indicate that the complex model promulgated in today's rule will not create fungibility problems despite its inclusion of nonlinear terms. This analysis is explained in greater detail in Section IV.F of the RIA.

G. Future Model Revisions

The complex model promulgated in this rulemaking reflects EPA's best understanding of the relationship between fuel characteristics and vehicle emissions. However, EPA expects future

research to clarify this relationship. EPA also recognizes that changes in in-use vehicle emission control programs (e.g., I/M programs) will continue to occur and that these changes may alter the relationship between fuel characteristics and in-use emissions. In addition, the Agency is concerned that augmentations to the model through vehicle testing (Section V) may, over time, accumulate to the point that a revised complex model, incorporating the current complex model database and all relevant information gathered since then, would be beneficial. As discussed in Section V, EPA plans to issue revised complex models when the Agency deems that sufficient new information is available to warrant such action. Model revisions will be developed through a formal rulemaking process.

H. Complex Model Performance of Simple Model Fuels

Fuels qualifying as reformulated under the simple model must meet specified benzene, oxygen, and RVP requirements while also satisfying the toxics performance standard. The RVP requirement differs between VOC control regions, and the requirements and standards also vary depending on whether compliance is being achieved on a per-gallon or averaging basis. In addition, levels of other fuel parameters are only specified under the simple model in terms of deviations from each refiner's baseline fuel. Evaluating the performance of simple model fuels under the complex model is difficult since fuel properties can vary widely.

However, it is possible to evaluate a set of fuels that are representative of expected, typical simple model fuels. EPA expects most refiners to pursue compliance on average (for all or part of their product slate) in order to maximize flexibility in day-to-day refinery operations and recoup compliance margins. Given present and projected conditions, EPA also expects that MTBE and ethanol will be the most commonly used oxygenates during Phase I of the reformulated gasoline program. The fuels specified in Tables IV-4 and IV-5 below include fuels

designed to meet the requirements of the simple model in both VOC control regions and using both oxygenates. The level of olefins, sulfur, E200, and E300 have been set to Clean Air Act baseline levels, while the level of aromatics has been set at the level necessary to comply with the toxics requirements of the simple model. Aromatics levels were assumed to be the same for summer and winter fuels.

Table IV-4.--Typical Simple Model Fuels Using MTBE

[Under Averaging]

Fuel				
	1	2	3	4
Fuel Description:				
Season	Summer	Summer	Winter	Winter
VOC Control Region.	1	2	1	2
Fuel Parameter:.				
RVP, psi	7.1	8.0	N/A	N/A
Oxygen, wt%	2.1	2.1	2.1	2.1
Benzene, vol%.	0.95	0.95	0.95	0.95
Aromatics, vol%.	27.5	26.3	27.5	26.3
Olefins, vol%.	9.2	9.2	11.9	11.9
E200, %	41	41	50	50
E300, %	83	83	83	83
Sulfur, ppm	339	339	338	338

Table IV-5.--Typical Simple Model Fuels Using Ethanol

[Under Averaging]

Fuel

5 6 7 8

Fuel

Description:

Season..... Summer..... Summer..... Winter..... Winter VOC Control 1..... 2..... 1..... 2

Region. Fuel Parameter:.

RVP, psi..... 7.1..... 8.0..... N/A..... N/A Oxygen, wt%... 2.1..... 2.1..... 2.1..... 2.1 Benzene, vol%. 0.95..... 0.95..... 0.95..... 0.95 Aromatics, 25.5..... 24.3..... 25.5..... 24.3

vol%.

Olefins, vol%. 9.2..... 9.2..... 11.9..... 11.9 E200, %..... 41..... 41..... 50..... 41 E300, %..... 83..... 83..... 83..... 83 Sulfur, ppm... 339 339 338 338

The performance of these fuels according to the complex model (using the MOBILE4.1 baseline as previously discussed) is summarized in Table IV-6.

Table IV-6.--Performance of Typical Simple Model Fuels Under the Phase I Complex Model

[Under Averaging]\1\

Emission reduction versus CAAB fuel (percent)

Fuel Nonexhaust

					Exhaust
VOC	VOC	Total VOC	NO <INF>X	Toxics	
1		7.92	51.42	36.57	1.46	27.33
2		5.35	23.93	17.11	1.28	24.57
3		0.33	N/A	0.33	-0.21	12.83
4		0.80	0.00	0.80	0.04	13.87
5		8.64	51.42	36.82	1.90	25.70
6		6.09	23.93	17.38	1.76	22.56
7		3.55	N/A	3.56	0.58	11.52
8		4.01	N/A	4.01	0.88	12.48 \1\Performance

of summer fuels (#s 1, 2, 5, 6) given relative to that of Clean Air Act summer baseline fuel. Performance of winter fuels (#s 3, 4, 7, 8) given relative to that of the winter baseline fuel defined in

Section III.

I. Phase I Performance Standards Under the Complex Model

All fuels produced during Phase I of the reformulated gasoline program must meet the VOC, toxics, and NO<INF>X requirements of the Act. Fuels certified using the complex model in Phase I must show either no increase in NO<INF>X emissions from baseline levels on a pergallon basis as discussed in the February 1993 proposal or a 1.5% reduction from baseline levels on average as discussed in Section VII. In addition, as discussed in Section III.E., such fuels must result in either a 15% reduction in total toxics emissions from baseline levels on a per-gallon basis or a 16.5% reduction in total toxics emissions from baseline levels on average.

With regard to the VOC standards, EPA considers fuels produced to meet the provisions of the

simple model to be producible. Thus, as discussed in the February 1993 proposal, EPA believes it feasible to base the Phase I standards for VOC emissions on the performance of fuels that meet the Simple Model requirements, provided that this performance is more stringent than minimum performance required by the Act. EPA considers the fuels whose VOC performances were evaluated in Section IV.H to be representative of Simple Model fuels. Under the reformulated gasoline program, VOC emissions are controlled only during the high ozone season. For this reason, the VOC performance standard has been determined by the performance of the Phase I summer fuels presented in Section IV.H. Since these fuels achieve emissons reductions that equal or exceed the minimum requirements set forth in the Act, the VOC performance standard during Phase I for fuels certified under the complex model has been based on the performance of these fuels. Setting the VOC performance standards in 1998-1999 equal to this VOC performance level, which EPA believes to be a reasonable estimate of the average performance of fuels produced in 1995-1997, preserves the integrity of the two-phase program specified by Congress and is consistent with the Agreement in Principle signed in 1991. The summer VOC performance of ``typical'' high ozone season simple model reformulated gasolines according to the complex model is presented in Table IV-6. In VOC Control Region 1, the simple model fuel reduces VOC emissions by 36.6 percent for the MTBE-containing fuel (Fuel 1) and 36.8 percent for the ethanol-containing fuel (Fuel 5). Since the 1998 performance requirements in VOC Control Region 1 are to be based on the performance of typical simple model fuels, and since Fuels 1 and 5 both satisfy the simple model requirements and are considered by EPA to be representative of typical simple model fuels, EPA has set its 1998 performance standards in VOC Control Region 1 so as to permit both of these fuels to meet the 1998 performance standards. In addition, EPA considers Fuel 1 to be more representative of typical simple model

fuels in VOC Control Region 1 since MTBE does not boost fuel RVP levels to the extent that ethanol does. As was discussed in the April 1992 and February 1993 proposals, EPA believes that per-gallon performance standard should be set 1.5 percentage points below the averaging performance standard. Hence high ozone season fuels certified using the complex model during Phase I of the reformulated gasoline program must provide a VOC emission reduction from baseline levels of 36.6 percent when complying on average and 35.1 percent when complying on a per-gallon basis. Similarly, high ozone season fuels certified using the complex model during Phase I in VOC Control Region 2 must provide a VOC emission reduction from baseline levels of 17.1 percent when complying on average and 15.6 percent when complying on a per-gallon basis. These standards are summarized in Table IV-7 for both VOC control regions, under averaging and per-gallon compliance. Note that a negative performance standard signifies a reduction from baseline emission levels.

Table IV-7.--Reformulated Gasoline Performance Standards Relative to Clean Air Act Baseline Gasoline for 1998-1999

[Percent]

Emission	VOC control region 1		VOC control region 2	
	Average	Per gallon	Average	Per gallon
VOC	-36.6	-35.1	-17.1	-15.6
Toxics	-16.5	-15.0	-16.5	-15.0
NO<INF>X	-1.5	0.0	-1.5	0.0

In summary, the per-gallon and averaging VOC performance standards under the complex model during Phase I is set by the performance of the corresponding simple model fuel when evaluated using the complex model. The toxics performance standard is set at the statutory requirement of a 15 percent reduction from baseline levels for per-gallon compliance and a 16.5 percent reduction for compliance on average. Similarly, the NO<INF>X performance standard under the complex model during Phase I must satisfy the no NO<INF>x increase requirement on a per-gallon basis, or meet a 1.5% reduction for compliance on average.

V. Augmenting the Models Through Testing

During the regulatory negotiation process, vehicle testing and emission modeling procedures for certifying that a gasoline complies with the NO<INF>X, toxics, and VOC requirements were discussed. Emission models such as the simple model described in Section III and the complex model described in Section IV offer several advantages over testing to determine emission effects. First, models can better reflect in-use emission effects since they can be based on the results of multiple test programs. Second, individual test programs may be intentionally or unintentionally biased due to vehicle selection, test design, and analysis methods. Third, fuel compositions tend to vary due in part to factors beyond the control of fuel suppliers such as variations in crude oil compositions and the inherent variability of refining processes. As a result, without one or more modeling options, each batch of fuel would have to be tested to ascertain its emission performance. Such levels of testing are neither desirable (because of the potential for intentional or unintentional bias in vehicle test programs) nor practical (because of the time and expense involved in vehicle testing). Fourth, models make more efficient use of scarce and expensive emission effects data than is possible otherwise. For these reasons, EPA believes that the modeling options outlined above are necessary for the reformulated gasoline

program to achieve its environmental objectives and to minimize the costs of the program. These emission models, however, reflect currently-available information and hence do not allow refiners to take advantage of emission benefits derived from new fuel additives or changes in fuel parameters not contained in the models. To allow for fuel technology development and innovation, the Agency also believes that testing has a role in certification as a means of supplementing the models. This section contains a detailed discussion of the provisions EPA is promulgating regarding the conditions under which testing is permitted, the manner in which test results can be used to supplement the models, and the minimum requirements for vehicle testing programs. As was first outlined in the February 1993 NPRM, the vehicle testing process described in this section has undergone significant changes since it was first proposed in the April 1992 SNPRM. These changes have been made in response to changes in EPA's approach to modeling the relationship between fuel properties and emissions, as described in Section IV, and comments received in response to the April 1992 and February 1993 proposals. The following discussion addresses the major substantive comments received by EPA regarding certification of fuels by vehicle testing. A detailed summary and analysis of comments can be found in Section IV.G of the RIA.

A. Applicability of Testing

Vehicle testing is the primary way that the effects of various gasoline formulations on motor vehicle emissions can be determined. As described above, data from vehicle testing programs forms the bulk of the basis for the simple and complex models. EPA believes that fuel certification through single test programs is inherently less reliable than certification through a testing-based model. The simple and complex models developed by EPA are based on a far greater amount of testing than would be available from any single test program. These models

incorporate and balance the varying and conflicting results of numerous test programs. The statistical variation associated with an individual test program may cause a fuel to show emission effects during testing that would not occur in-use. Therefore, EPA proposes that testing only be permitted to augment the models for fuel effects that are not covered in the models.

B. Augmenting the Simple Model

Due to the belief that fuels certified by vehicle testing should be evaluated in conjunction with the most complete emission model available to more accurately determine the emission benefits of the fuels being tested, EPA proposed that vehicle testing be permitted to augment the simple model only for the effect of oxygenates on NO<INF>x emissions beyond the simple model's oxygen caps. All other testing was to have been performed to augment the complex model. Based on data collected since the time of the proposal on the effect of oxygenates on NO<INF>x, EPA no longer believes it appropriate to augment the simple model even in the limited manner described above. Considerably more data are available in the complex model database regarding the effect of oxygenates on NO<INF>x emissions than would be provided by any individual test program. Therefore, testing can only be performed to augment the complex model. Fuels with oxygen concentrations in excess of 2.7 weight percent must be certified using the complex model.

C. Augmenting the Complex Model

EPA believes that the objective of testing under the complex model should be to evaluate the emission effects of fuels whose emission effects cannot be adequately represented by the model. Such fuels would include fuels claiming emission effects from parameters not included in the complex model and fuels containing complex model parameters at levels beyond the range covered by the model. Without this constraint, it may be possible for a fuel producer to use the

statistical variation associated with testing to claim emission effects through testing which would not be demonstrated in-use, when tested to a greater degree, or when modeled. For example, a fuel that would fail to meet the VOC requirement by a small margin when evaluated under the complex model could be tested and shown to meet the VOC requirement due to the testing error associated with any vehicle testing program. In addition, allowing testing of existing modeled parameters essentially would make the complex model, and the associated emission performance standards, a fluid target. Fuel producers would lose the certainty associated with a fixed model and the confidence that their capital investments will be useful for a fixed amount of time. Therefore, vehicle testing can be used only to determine the emission effects of parameters not adequately represented by the complex model. The emission effects of the fuel parameter in question will be determined by combining the emission effects determined through vehicle testing with the emission effects predicted by the complex model. Furthermore, each testing program can be used to identify the effects of only one new fuel parameter, unless the changes in other fuel parameters are a natural and inherent consequence of the primary fuel modification. Without this constraint, EPA believes that accurate determination of the effects of specific fuel parameters would be more difficult due to the inherent variability in testing programs and the increased opportunities for gaming.

In addition, fuel suppliers opting to augment the complex model through vehicle testing must examine the extent to which emissions are affected when fuels certified with the augmented complex model are mixed with other fuels. The Agency is concerned with two potential problems when different fuels are combined. First, the emission effects of a parameter, as determined from vehicle testing, may not behave linearly as fuels with one level of the parameter are mixed with fuels with different levels of the same parameter. The degree to which this

process occurs is referred to in this notice as the parameter's dilution effect. Dilution effects are evident in the complex model proposed in February 1993 and in the model being promulgated today. Second, the emission effects of various fuel parameters may be affected by the level of other fuel parameters. The degree to which this process occurs is referred to in this notice as an interactive effect. If such effects are present (as in the complex model proposed in February 1993 and in the complex model being promulgated today), actual emission performance of the fuel mixture in-use could be worse than emission performance predicted from the complex model augmented by vehicle testing results. Therefore, the testing process must be structured so as to identify dilution and interactive effects.

D. Advance Approval of Test Programs

Given the number of factors involved in designing a test program, the potential for inappropriate design is high. EPA wishes to avoid submittal of petitions based on test data from poorly designed programs in order to assure that the time and money invested in such programs is well-spent and to assure that all augmentations to the model are based on accurate data from well-designed test programs. Hence EPA will require petitioners to obtain advance approval from the Agency for their proposed vehicle testing programs. EPA will consider petitions to augment the model only if based on the results of approved testing programs. Furthermore, EPA retains the discretion to evaluate other data when evaluating petitions to augment the complex model and when determining the nature, extent, and limitations of the augmentation. This data may include the existing complex model database, additional vehicle testing programs, and other augmentation applications. Petitioners are required to include the following information when submitting a test program plan for approval: the fuel parameter to be evaluated for emission effects; the number and description of vehicles to be used in the test, including model year,

model name, VIN number, mileage, emission performance, technology type, and vehicle manufacturer; the methods used to procure and prepare the vehicles for testing; the fuels to be used in the testing program, characterized as defined in Section V.I.5; the pollutants and emission categories to be evaluated; the methods and precautions to be used to ensure that the effects of the parameter in question are independent of the effects of other parameters already included in the complex model; a description of the quality assurance procedures to be used during the test program, and the identity and location of the organization performing the testing. EPA anticipates and encourages petitioners to submit the information listed above in stages beginning with the most general and ending with the most specific in order to streamline the approval process and eliminate wasted effort. EPA will work with petitioners to remedy unsatisfactory aspects of their proposed testing program. These provisions provide the Agency with greater assurance that petitioners would not selectively report test results to the Agency that support their petitions. Petitioners would still be able to ``game'' the testing process by pre-screening vehicles to obtain a test fleet with the desired sensitivity to the proposed parameter. However, such a test fleet would have to be re-tested as part of the formal test program and hence would be subject to the variability inherent in vehicle testing, which would tend to reduce the gaming benefits from pre-screening. EPA believes that the risks and costs associated with re-testing will tend to dissuade petitioners from attempting to manipulate the testing process in this manner. EPA further requires that the results of all approved testing programs be submitted to the Agency, even if the parameter in question proves not to provide an emission benefit. The Agency believes this requirement is necessary to ensure that all available data is at the Agency's disposal when evaluating proposed augmentations to the complex model and when updating the model itself. EPA does not intend to use this provision to limit legitimate,

innovative test programs. Rather, EPA is only interested in preventing the creation of artificial fuel parameters that claim to be the source of emission effects which are in reality only normal statistical variability. An example may help clarify the problems that can arise if testing is permitted for such artificial parameters. The level of C10+ aromatics (aromatics whose molecules contain ten or more carbon atoms) influences a fuel's E200, E300, and total aromatics levels. A testing program to identify the effects of C10+ aromatics may indicate that an emission effect from such compounds exists when the effect is actually due to differences in the fuels' E200, E300, and total aromatics levels or to the inherent statistical variability associated with vehicle testing. A petition for approval of a test program to identify the effects of C10+ aromatics would be required to identify specific measures to be taken to isolate the emission effects of C10+ aromatics from those of E200, E300 and total aromatics, all three of which are included in the complex model. In this example, EPA might require that certain test fuels contain identical levels of E200, E300, and total aromatics; that more rigorous statistical tests be used to identify genuine C10+ aromatics effects beyond those already incorporated in the complex model for E200, E300, and total aromatics; that the fuels used in the test program meet more detailed compositional criteria to ensure their representativeness; or that additional vehicles and/or fuels be tested. This provision helps assure that the effects observed in vehicle testing programs are genuine and will occur in-use.

E. Exclusive Rights to Augmentation

EPA's April 1992 and February 1993 proposals discussed the advantages and disadvantages of providing a system of exclusive rights to model augmentations. EPA has given this matter further consideration, including consideration of comments regarding exclusive rights. The Agency has concluded that the reasons given in its April 1992 proposal for not providing a

system of exclusive rights are still valid. Hence the regulations governing augmentation of the complex model through vehicle regulation being promulgated today do not provide for exclusive rights to augmentations. Each augmentation will be available to any refiner desiring to utilize it, and no restrictions are provided under this rulemaking for exclusive rights, other than those granted under other legal code (e.g., patent law). The Agency does not believe adequate authority exists to promulgate exclusive rights provisions under this rulemaking. Furthermore, as discussed in the April 16, 1992 proposal, there are a number of reasons from economic, administrative, and air quality perspectives that make open use of model augmentations a desirable public policy. To allow interested parties to review and comment on a model augmentation, EPA will publish a description of the augmentation and its supporting data and information for public comment prior to approving an augmentation for use. In keeping with the provision of the Act, EPA will take into account any comments received, and act upon any request received for fuel certification through model augmentation within 180 days of such a request being completed.

F. Duration of Augmentation

In its April 1992 proposal, EPA proposed that augmentations would remain in effect until the next subsequent complex model update was issued. EPA further proposed that if an augmentation had been valid for three or fewer years upon implementation of the subsequent update to the complex model, then refiners were permitted to continue using the augmentation in conjunction with the previous complex model for an additional length of time, subject to certain restrictions. EPA has received a number of comments on this proposal. Today's rule includes a set of limitations on the duration of the augmentation that incorporate some elements of these comments. These limitations are described below. The Agency is concerned that fuel suppliers

not be allowed to claim emission effects in perpetuity based on the testing program described in this section due to the smaller degree of statistical confidence in such effects compared to those included in an updated complex model. The Agency also recognizes the need for fuel suppliers to recoup investments made to reformulate gasoline, including investments to utilize the emission effects identified through vehicle testing. Therefore, petitioners will be permitted to use emission effects determined through vehicle testing only for a limited period of time. In general, this period of time extends until an updated version of the complex model takes effect. Updates to the complex model will be issued by EPA through a formal rulemaking process at such time that the Agency determines that sufficient additional data has become available to warrant issuing such an update. Since some augmentations may be in place for a relatively short period of time before the model is updated, the Agency may not be able to adequately assess the augmentation. However, if a proposed update to the complex model is issued within three years of the time at which the augmentation takes effect, then fuel suppliers may be permitted to continue using the augmentation to determine the emission effects of reformulated gasolines. Specifically, if the Agency does not formally accept, reject, or modify the augmentation in question for inclusion in the updated complex model, then the augmentation will remain available until the next update to the model takes effect. If the Agency reviews the augmentation and either excludes the augmentation entirely or includes the augmentation in a modified form, then the augmentation will remain available for use in its original form, in conjunction with the complex model for which the augmentation was issued, to those fuel producers who can demonstrate to the Administrator's satisfaction that they have begun producing fuels that are certified using the augmentation. In such cases, the augmentation may continue to be used for five years from the date the augmentation took effect or for three years of fuel production,

whichever is shorter. For the reasons discussed above, augmentations to the model for the effects of a given parameter over a particular range are permitted only once. Regardless of whether the emission effects of a parameter are included in an updated model, the augmentation can neither be used nor renewed (even with data from a second identical test program) once the maximum time period for use of a model augmented with the effects of that parameter has expired. Further testing is permitted, however, to provide EPA with the additional data needed to include the effect in a future update to the model.

G. Limits on the Range of an Augmentation

Fuel suppliers will be permitted to claim the emission effects of augmentations only to the extent that the test program measured the effects of the fuel parameter in question over the range in question. If the parameter is included in the complex model, then the augmentation will be valid for fuels containing levels of the parameter between the level tested in the test program and the nearest limit of the complex model (as described in Section IV). If the parameter is not included in the complex model, then the augmentation will be valid for fuels containing levels of the parameter between the candidate and baseline levels (i.e., the levels found in Addition Fuels 1 and 3 in Table V.1). This provision is intended to be consistent with the limits on the application of the simple and complex models as expressed in Sections III and IV.

H. EPA Approval, Confirmatory Testing, and Fees

In the process of reviewing a model augmentation, EPA must confirm the accuracy of the test results. To this end, EPA intends to monitor the petitioner's test program. The Agency also reserves the right to perform confirmatory testing to assure the validity of the test results and the emission performance of the reformulated fuel before allowing augmentation of the model. EPA further reserves the right to collect fees any lawful of an amount sufficient to recoup all costs

associated with such confirmatory testing. EPA anticipates that if any confirmatory testing is performed that it will be of a limited nature and focused only on those aspects of the test program which are unexpected or contrary to prior test programs and engineering knowledge. Since EPA has not proposed methods to be used to calculate and collect such fees, these provisions will be handled through a subsequent rulemaking.

I. Test Requirements

1. Winter Testing

To be certified as reformulated, a gasoline must meet the air toxics and NO<INF>X emission requirements year-round; the oxygen, benzene, and heavy metal content requirements year-round, and the VOC emission requirements in the high ozone season. As discussed in Section IV of this notice and Sections III and IV of the RIA, the Agency does not have sufficient data to model winter exhaust emissions. While differences between the effects of fuel parameters under summer and winter conditions beyond those discussed in Section IV may exist, the Agency does not have any evidence to date to suggest that they are significant. Therefore, EPA will apply the exhaust models developed for summer emissions to winter fuels as well for purposes of determining their air toxics and NO<INF>X emissions. The Agency is concerned that allowing winter testing for some fuel parameters while modeling the effects of other parameters based on summer emission data creates the possibility of ``gaming" the testing process. Fuel suppliers could use the summer model to determine the effects of parameters that would behave unfavorably under winter conditions and use winter testing to determine the effects of parameters that would behave favorably under winter conditions. This possibility may result in fuels being certified for winter use (through a combination of winter testing and summer modeling) that result in smaller emission reductions in-use than are intended by the Act or than

would occur by using the summer model. Therefore, EPA is at this time requiring that all testing be performed under summer ambient conditions. As the Agency gathers additional data in the future with which to revise the model, EPA will consider whether sufficient winter test data exists to permit the development of winter NO<INF>X and air toxics models. If such models can be developed, the Agency will consider whether to allow winter testing.

2. Pollutants to be Measured

To the extent testing is performed to augment the complex model, it must be performed to determine the emission effects on all the pollutants covered by the reformulated gasoline certification requirements, including toxics (carbon monoxide and carbon dioxide emissions must also be measured to permit validation of test results). Failure to have such a requirement might result in important emission effects being overlooked and could allow fuel producers to ``game" the certification requirements by permitting them to utilize the modeling option for one pollutant and the test results for another pollutant when it would be advantageous. The resulting certified reformulated gasolines may not meet all of the applicable emission reduction requirements in-use. For example, the model augmented by test results may indicate that a fuel meets the VOC requirement but fails the toxics requirement, while the model alone may indicate that the fuel meets the toxics requirement but fails the VOC requirement. Allowing the petitioner to claim the toxics emission effects predicted by the model while claiming VOC benefits determined through testing would ignore fuel effects on toxics that may not be addressed by the model. Testing costs would be significantly reduced if only VOC and NO<INF>X emissions were measured by testing, and toxics emissions were allowed to be modeled. However, since the testing option can only be used when the candidate fuel's parameters fall outside of the range of the model, EPA believes that adequate information seldom would be available to allow toxics

emissions from such fuels to be modeled adequately if adequate information on VOC and NO<INF>X emissions were not available. If a fuel parameter is expected to affect VOC or NO<INF>X and is not covered by the model, toxics emissions may very well be affected and should be measured. It should be noted, however, measurement of toxics emissions for the fuels used to determine interactive effects (discussed below in section IV.I.4.) need not be performed. During development of the complex model, EPA found that interactive effects for air toxics are either statistically insignificant, impossible to discern given the accuracy and extent of available data, or too small to contribute substantially to the model's explanatory and predictive power. The complex model being promulgated today contains no interactive terms for air toxics emissions for these reasons, and hence EPA considers it unnecessary to require testing for interactive effects on air toxics. Specifically, toxics emissions need not be measured when testing additional Extension Fuels to determine interactive effects or when testing Addition Fuels 4, 5, 6, and 7, as described in Section V.I.5. However, EPA reserves the right to require that toxics be measured during vehicle testing programs when evidence exists that adverse interactive effects may exist for toxics. In particular, EPA reserves the right to require testing for interactive toxics effects if future revisions to the complex model include such effects. To better optimize the test program for the particular fuel parameter being evaluated, the Administrator may approve a request to waive certain pollutant measurement requirements contained in this section. Any such waiver would have to be obtained in advance of vehicle testing. A request for such a waiver must include an adequate justification for the requested change, including the rationale for the request and supporting data and information. Such a request must justify the reason that measurement of certain pollutants clearly is not necessary, and identify those pollutants for which additional testing may be warranted. For example, a petition might note that reducing the

concentration of a specific high molecular weight aromatic decreased VOC emissions even though the overall concentration of similar aromatics remained unchanged. The petitioner may be able to justify a reduced need for toxics measurement based on the results of other studies which show that toxics are proportional to total aromatics rather than to individual aromatics species. In exchange, additional testing may be justified for VOC emissions to enable a greater degree of statistical confidence in the test results. As a result, the fuel supplier may be able to present EPA with sufficient justification to warrant increased testing for VOC emissions and decreased testing for toxics emissions.

3. Exhaust and Nonexhaust Testing

VOC and air toxics emissions occur in both exhaust and nonexhaust emissions. However, EPA believes that the relationship between fuel characteristics and nonexhaust emissions is known with greater certainty and precision than the relationship between fuel characteristics and exhaust emissions. Nonexhaust emissions are a much simpler phenomenon to model than exhaust emissions. Nonexhaust emissions are driven primarily by well-understood principles of physical chemistry and are modified by devices such as charcoal canisters that are relatively easily modeled. Exhaust emissions, by contrast, involve combustion and catalysis reactions that are not as well understood theoretically and are much more difficult to model. In addition, exhaust emissions are estimated directly from the Federal Test Procedure (FTP) utilizing the Urban Dynamometer Driving Schedule, while nonexhaust emissions are estimated from both FTP and non-FTP test cycles in a complex process. Finally, data on nonexhaust emissions is much more extensive and internally consistent than data for exhaust emissions. For these reasons, EPA is restricting testing to augment the model to exhaust emission testing. Vehicle testing of nonexhaust emissions will not be accepted by EPA as the basis for augmentations to

the nonexhaust emission model promulgated in today's rulemaking. EPA reserves the right to revise the nonexhaust emission model in the future to reflect new data acquired by the Agency, with such revisions taking effect after the start of Phase II of the program. In particular, either a new MOBILE model or ongoing research aimed at modeling nonexhaust emissions as a function of true vapor pressure over a range of temperatures may provide the basis for a revised nonexhaust model. The nonexhaust complex model being promulgated today relies on the Reid vapor pressure (RVP) to characterize fuels' nonexhaust emission characteristics. However, RVP is measured at a fixed fuel temperature (100 deg.F), while nonexhaust emissions occur over a wide range of fuel temperatures (80 deg.F to 130 deg.F). Since different oxygenates alter the relationship between RVP and true vapor pressure at a given temperature to different extents, EPA believes that a model based on true vapor pressure would be more accurate for fuels containing oxygenates than a model based solely on RVP. By permitting nonexhaust emissions from a given fuel to be estimated only from models and exhaust emissions to be estimated based in part on vehicle testing, EPA believes that the accuracy of fuel emission estimates will be enhanced. EPA also believes that this restriction will focus testing resources on those emission effects which the model predicts with the least degree of certainty (i.e., exhaust emissions), thereby improving the degree of certainty of emission predictions over the long run.

4. Eligibility of Fuel Properties for Testing In providing for augmentation of the complex model through vehicle testing, EPA's intent is to provide refiners with the ability to take advantage of new or ongoing research into the relationship between fuel properties and exhaust emissions. As discussed elsewhere in this section, however, the Agency believes that the complex model is more accurate and reliable than any single test program for the parameters included in the model.

Therefore, augmentation by testing will be permitted only for certain fuel parameters and for certain levels of those parameters. Augmentations will not be permitted for fuel parameters that are included and quantified in the complex model database, regardless of whether they appear in the complex model itself. Such parameters were either not identified or identified and later rejected during the rulemaking process, which included a series of regulatory negotiation meetings, public workshops, and public meetings. EPA believes that the opportunities for error far exceed the potential emission benefits from allowing model augmentations using parameters that did not survive the peer review process.

Augmentation through vehicle testing will be permitted to extend the valid range of the complex model for parameters already included in the model. The purpose of such testing would be to determine the behavior of the parameter within this extended range. Augmentations also will be permitted for parameters that neither have been included in today's complex model nor were measured for the fuels contained in the complex model database. The purpose of testing in this case would be to determine the behavior of new parameters, including any dilution and interactive effects. The test requirements differ for these two cases to reflect differences in existing knowledge and environmental risk.

5. Test Fuels

The Agency has three major goals that must be satisfied before accepting an augmentation to the complex model. First, the augmentation must provide proper credit for fuel modifications. Second, the augmentation must account for dilution effects properly. Third, the augmentation must account for interactive effects between the parameter being tested and other fuel parameters properly. EPA believes that these three goals cannot be met without specifying at least some of

the characteristics of fuels to be included in a test program. The remainder of this section describes the basic characteristics of the fuels required as part of a vehicle test program. a. Fuels required to extend the range of existing complex model parameters. Three ``extension fuels" must be included in test programs intended to extend the range of the complex model for a given parameter to a more extreme level. Extension fuel #1 would contain the more extreme level of the parameter being extended in order to determine the parameter's effects on emissions at this more extreme level. Extension fuel #2 would contain the parameter being extended at levels at or near its current lower limit in the model. Extension fuel #3 would contain the parameter being extended at levels at or near its current upper limit in the model. These latter two fuels are necessary in order to estimate the size and significance of squared terms involving the parameter being extended. For all three fuels, the levels of other complex model parameters are to be set at the levels specified in Table V.2, which the Agency believes are representative of levels that will be found in typical reformulated fuels. In addition, all three fuels must be blended from representative refinery streams to the extent practicable. The three extension fuels must meet the requirements presented in Tables V.1 and V.2 to within the blending tolerances specified in Table V.4.

If the Complex Model contains interactive effects between the parameter in question and other parameters, two additional fuels must be tested to quantify the magnitude of any such effect at extended levels of the parameter in question. For each interacting parameter, the two additional fuels would contain the parameter being tested at levels identical to that found in Extension Fuel #1. The interacting parameter would be present at the levels specified in Table V.1 for Extension Fuels 2 and 3, respectively, in the two additional fuels in order to quantify the size of the interactive effect over its full range. Other parameters would be set at the levels specified in

Table V.2. It should be noted that since today's complex model includes only one interactive term (involving aromatics and E300), this situation would arise relatively infrequently.

Table V.1 --Level of Existing Complex Model Parameters Being Extended

Fuel property being extended	fuel #	fuel #2	fuel #3	Sulfur, ppm
Extension	80	450		
Benzene, vol%.....	Extension Level.	0.5	1.5	
RVP, psi.....	Extension Level.	6.7	8.0	
E200, %.....	Extension Level.	38	61	
E300, %.....	Extension Level.	78	92	
Aromatics, vol%.....	Extension Level.	20	45	
Olefins, vol%.....	Extension Level.	3.0	18	
Oxygen, wt%.....	Extension Level.	1.7	2.7	
Octane, R+M/2.....	**87.5.....**	**87.5**	**87.5**	

Table V.2 --Levels for Fuel Parameters Other Than Those Being Extended

Fuel property	fuel #1	fuel #2	fuel #3	Sulfur, ppm
	Extension	Extension	Extension	150

150 150 Benzene, vol%..... 1.0 1.0 1.0 RVP, psi..... 7.5 7.5 7.5 E200, %..... 50 50 50 E300, %..... 85 85 85 Aromatics, vol%..... 25 25 25 Olefins, vol%..... 9.0 9.0 9.0 Oxygen, wt%..... 2.0 2.0 2.0

Octane, R+M/2..... 87.5 87.5 87.5

b. Fuels required to qualify new complex model fuel parameters. Seven ``addition fuels" must be included in test programs intended to augment the complex model with fuel parameters not included in the model. These fuels are intended to provide the data necessary to estimate linear, squared, and interactive emission effects for the parameter being tested. The fuel parameter values for all seven addition fuels are specified in Table V.3; these values must be met to within the blending tolerance ranges specified in Table V.4.

Table V.3.--Properties of Fuels To Be Tested When Augmenting The Model With A New Fuel Parameter

Fuels							
Fuel property	1	2	3	4	5	6	7
Sulfur, ppm	150	150	150	35	35	500	500
Benzene, vol%	1.0	1.0	1.0	0.5	0.5	1.3	1.3
RVP, psi	7.5	7.5	7.5	6.5	6.5	8.1	8.1
E200, %	50	50	50	62	62	37	37
E300, %	85	85	85	92	92	79	79
Aromatics,							

Parameter\1\	C	C+B	B	C	B	C	B	
(R+M)/2.....	87	87	87	87	87	87	87	New
wt%.....	2.1	2.1	2.1	2.7	2.7	1.5	1.5	Octane,
vol%.....	9.0	9.0	9.0	2.0	2.0	18	18	Oxygen,
vol%.....	27	27	27	20	20	45	45	Olefins,

2

\1\C=Candidate level, B=Baseline level

In Table V.3, Fuel 1 is the candidate fuel, Fuel 3 is the candidate-baseline fuel, and Fuel 2 is a dilution fuel that is tested to determine whether emissions respond linearly to levels of the candidate fuel parameter. Testing on addition fuels 1, 2, and 3 will provide the data needed to assess the emission effects of the parameter being tested in isolation. Three separate levels of the parameter are specified in order to provide data to estimate both linear and squared terms involving the parameter, while other fuel parameters have been set at levels expected to be typical of in-use reformulated gasolines. Fuels 4 and 5 are low-emitting fuels with candidate and baseline levels of the parameter in question. Fuels 6 and 7 are the corresponding highemitting fuels. Testing on these four fuels will provide the data needed to assess the existence and size of interactive effects between the parameter being tested and other fuel parameters already included in the complex model. Estimating these effects for very high emitting fuels (addition fuels 6 and 7) and very low emitting fuels (addition fuels 4 and 5) maximizes the sensitivity of the test program to such effects.

If the parameter being tested is not specified for CAA baseline gasoline, its baseline level must be comparable to its level in gasoline representative of commercial reformulated gasolines.

Petitioners are required to obtain approval for the baseline level of this parameter from the Agency prior to beginning their vehicle test programs. Such approval would depend in part on the use of an appropriate basis for determining the properties of ``representative" commercial reformulated gasolines. The basis for this specification and for the specifications described in Table V.3 are discussed more fully in section IV.G of the RIA.

c. Other fuels requirements. To produce fuels with the parameter values listed above for the extension and addition fuels, the amount and type of paraffins present in each fuel may require adjustments. These adjustments must reflect the distribution of paraffin types in representative refinery streams. Two other issues must also be addressed regarding the composition and properties of extension and addition fuels. First, non-compositional fuel properties such as RVP, E200, and E300 may differ from the values specified in Tables V.2 and V.3 as a natural result of compositional differences among fuels or as a result of the inherent variability in blending processes. In such cases, the complex model is to be used to compensate for such differences when evaluating vehicle testing results, as described in section 80.48 of today's regulations.

Second, EPA also is concerned that variations due to blending may cause fuel parameters not included in the model to vary among fuels, and such parameters may have significant emission effects not predicted by the model. To minimize this risk, the properties of the various fuels must match those specified in Tables V.1 through V.3 to within the tolerances defined in Table V.4. In addition, the extension and addition fuels must be blended from identical refinery streams to the extent possible. Failure to meet this requirement would reduce the certainty that emission effects found in vehicle testing are due solely to the parameter being tested. However, if a petitioner can show that it is not feasible to meet all such tolerances for the petitioner's fuels due either to: (1) Naturally-resulting changes in fuel parameters arising from changes in the parameter(s) in

question or (2) blending technology limitations, EPA will consider modifying the relevant tolerances. Any such request must come prior to the start of the test program. In such cases, EPA reserves the right to use the model and relevant data from prior augmentation petitions to adjust for whatever differences remain among the fuels.

Table V.4 --Fuel Parameter Blending Tolerances

Fuel parameter	Blending tolerance
Sulfur content	<plus-minus>25 ppm.
Benzene content	<plus-minus>0.2 vol %.
RVP	<plus-minus>0.2 psi.
E200 level	<plus-minus>2 %.
E300 level	<plus-minus>4 %.
Oxygenate content	<plus-minus>1.0 vol %.
Aromatics content	<plus-minus>2.7 vol %.
Olefins content	<plus-minus>2.5 vol %.
Saturates content	<plus-minus>2.0 vol %.
Octane	<plus-minus>0.5.
Candidate parameter	To be determined as part of the

augmentation

process.

An octane requirement of 87.5 (measured by the (R+M)/2 method) must be met for all fuels used in vehicle testing to within the tolerance specified in Table V.4, unless octane itself is the fuel property being evaluated for its effect on emissions. All test fuels must also contain detergent additives in concentrations adequate to meet the requirements of section 211(l) of the Act, and the concentration must be within ten percent of the average detergent concentration for all fuels included in the test program.

6. Test Procedures

For the reformulated gasoline program to achieve actual in-use reductions in fuel-related VOC and toxics emissions, certification test results must correlate with reductions in in-use emissions. No test procedure, however, is completely representative of all in-use conditions. The range of vehicle uses and operating conditions and the range of geographical and climatic conditions throughout the country prevent a single test procedure from being entirely representative. However, EPA has developed or is in the process of developing test procedures which attempt to reflect a broad spectrum of in-use vehicle operating conditions. These test procedures were used in part to develop the emission factors in EPA's MOBILE4.1, MOBILE5, and MOBILE5A emission models, which in turn have been used to develop the modeling option for fuel certification. To maintain consistency between the certification methods, these test procedures also are to be used for vehicle testing to augment the model.

a. Exhaust emission testing. Exhaust emissions must be measured through the use of the Federal Test Procedure (FTP) for new vehicle certification (Subpart B of Part 86 of the Code of Federal Regulations) with modifications to allow vehicle preconditioning between tests on different fuels and to provide for benzene, formaldehyde, acetaldehyde, and 1,3-butadiene

sampling and analysis. Since POM (the fifth regulated toxic air pollutant) cannot currently be measured accurately and since no single measurement procedure is generally accepted, its measurement is not required. A detailed description of the toxics measurement procedures can be found in section 80.55 and section 80.56 of the regulations for this rulemaking.

b. Fuel parameter measurement precision. One source of error in testing programs as described in this section is uncertainty in the composition and properties of the fuels being tested. Since fuel testing is far less expensive than vehicle emission testing, EPA believes it is highly cost effective to measure the properties of the fuels multiple times to reduce the uncertainty in projected emissions due to uncertainty in fuel composition. As a result, at minimum, the properties defined in Table V.5 must be measured a sufficient number of times to reduce the 95 percent confidence interval, as calculated using a standard t-test, to the tolerances defined in Table V.5.

Table V.5.--Fuel Parameter Measurement tolerances for Fuel Certification by Vehicle Testing

Parameter	Measurement tolerance (95 percent confidence interval)
API Gravity	<plus-minus>0.2 deg.API.
Sulfur content	<plus-minus>5 ppm.
Benzene content	<plus-minus>0.05 vol %.
RVP	<plus-minus>0.08 psi.

Octane..... <plus-minus>0.1 (R+M/

2).

E200 level..... <plus-minus>2 %. E300 level.....

<plus-minus>2 %. Oxygenate content..... <plus-minus>0.2 vol

%.

Aromatics content..... <plus-minus>0.5 vol

%.

Olefins content..... <plus-minus>0.3 vol

%.

Saturates content..... <plus-minus>1.0 vol

%.

Octane..... <plus-minus>0.2. Candidate parameter.....

To be determined as

part of the

augmentation

process.

EPA recognizes that fuels used in vehicle testing may differ significantly in composition in terms of specific chemical species while appearing to be identically composed in terms of broad chemical families. The Agency further recognizes that such compositional differences may result in emission effects, and that such differences may confound or be used to ``game" testing programs. Therefore, the fuels used in vehicle testing must be blended from representative refinery streams, and their composition must be fully characterized by gas chromatography or equivalent analysis methods (following the methodology used in the Auto/Oil study<SUP>3) and the results submitted to EPA. Petitioners would have the option of either submitting these results for approval prior to beginning vehicle testing or including these results in their

completed petition. However, in either case, EPA would retain the authority to require modifications to the test fuels to ensure that their compositions are appropriate. Hence petitioners electing not to obtain prior approval of their fuel compositions would assume the risk that EPA may require modifications to the petitioner's test fuels upon receipt of the completed petition, thereby invalidating any testing the petitioner may have completed.

\3\Auto/Oil Air Quality Improvement Research Program, Technical Bulletin #1, December 1990.

EPA received a number of comments on its fuel specification and measurement precision proposals. Many of these comments have been incorporated in today's testing regulations, notably removal of the end point specification and inclusion of detergents and octane specifications. A detailed discussion of comments can be found in Section VI.G of the RIA.

c. Other test fuel provisions. To maximize the accuracy and confidence in the results from a test program of the magnitude specified in this section, it is good practice to ensure that systematic changes in the emission characteristics of the test vehicles do not occur during testing. Such effects can overwhelm the fuel effects being measured. Therefore, the first fuel tested in any given vehicle must be retested in that vehicle at the end of the test program. In addition, the order in which fuels are tested on each vehicle must be randomized to prevent carryover effects from biasing test results.

In response to comments, EPA has decided to remove the requirement for repeat measurements of VOC and NO<INF>X emissions from each fuel. EPA considers the measures described above to provide adequate quality assurance without repeat measurements and recognizes that removal of the repeat testing requirements will make vehicle testing significantly less onerous and time-consuming.

7. Vehicle Selection

a. 1990 Equivalency. Section 211(k)(3) of the CAA specifies that the required reductions in VOC and toxics emissions are to be measured from the emissions of those pollutants from ``baseline vehicles.'' Section 211(k)(10)(A) defines baseline vehicles as representative model year 1990 (MY-90) vehicles. However, in order to simplify test vehicle selection and remain consistent with the practices used to develop the complex model, other model year vehicles may be included in the test program. Specifically, 1986 through 1989 model year vehicles may be tested if the 1990 version had an engine and exhaust system that was not different from the earlier model year versions in ways that could affect the emission performance of the vehicles (i.e., if the model's EPA emission certification data were ``carried over'' through the 1990 model year<SUP>4). EPA retains the right to reject any non-1990 model year vehicle that the manufacturer deems to be different in terms of emission control technology or engine design from 1990 vehicles made by that manufacturer. The test fleet must be composed only of light-duty vehicles and light-duty trucks, in keeping with the practices followed in developing the complex model.

\4\For a more complete explanation of this issue, please see ``1990 Baseline Vehicles,'' memorandum from David Korotney to EPA Air Docket A-92-12, November 30, 1993.

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b. Vehicle selection criteria. Another consideration in vehicle selection is the condition of the test vehicles. EPA believes that Congress intended that the required VOC and toxics emission reductions be achieved not only at certification but also in-use. In order for this to be true, the test vehicles' condition should be representative of that of in-use vehicles. Therefore, for the purposes of the reformulated gasoline program, representative vehicles must have emission performances typical of the in-use emission performance of 1990 vehicles over their lifetime, a technology mix similar to that of the 1990 model year fleet, and a minimum of 4,000 miles of

service to assure break-in of engine and emission control system components. In addition, the test fleet must contain vehicles with a distribution of VOC emissions similar to that of in-use vehicles. Emissions of other pollutants tend to respond in a similar manner (e.g., carbon monoxide and air toxics) or in an essentially uncorrelated manner (e.g., NO<INF>X).

In order for the emissions effects measured during vehicle testing to reflect the emission effects that will be experienced by actual inuse vehicles, EPA considers it necessary to control the composition of the test fleet. As discussed in Section IV, EPA's complex model has identified significant differences in the effects of fuel modifications on emissions among vehicles from different emitter classes and technology groups. EPA's vehicle fleet requirements are intended to assure that a sufficient number of vehicles are tested to provide statistical confidence in observed emission effects, to assure that the vehicles tested are representative of the emission characteristics of in-use vehicles, and to assure that the vehicles tested have emission control technologies that are representative of emission control technologies found on 1990 model year vehicles. (1) Higher Emitters/Normal Emitters. In order that the test fleet for exhaust emission testing reflect the distribution in vehicle emission performance in-use, the test fleet must consist of two exhaust VOC emitter subfleets, normal emitters and higher emitters. The proportion of vehicles in each subfleet is to be set equal to the distribution of vehicle emission performance when enhanced I/M programs are in place. These proportions are shown in Table V.6, which is based on an EPA analysis<SUP>5 of the distribution of the in-use emission performance of a hypothetical fleet composed entirely of 1990 model year vehicles when subject to an enhanced I/M program. This distribution is consistent with the assumptions made in developing the Phase II Complex Model.

\5\``Exhaust VOC Emission Inventory By Vehicle Emitter Class Following Implementation of

an Enhanced Inspection and Maintenance (I/M) Program", Memorandum from Christian Lindhjem and David Brzezinski to EPA Air Docket A-92-12, June 24, 1993.

Table V.6.--Emitter Groups and In-Use Emissions

Emitter group	Fraction of in-use fleet	Emission fraction	
		VOCs	NO<INF>X
Normal: ≤2 x THC Standard (≤0.82 g/mi)	0.738	0.444	0.738
Higher: <gr-thn-eq>2 x THC Standard (<gr-thn-eq>0.82 g/mi)	0.262	0.556	0.262

An option had been proposed for comment which would not have separated the test fleet into separate emitter groups under the assumption that they may not respond differently to fuels. However, EPA's analysis of the complex model database and the complex model itself indicates that this assumption is invalid. Hence EPA has determined that the test fleet must contain vehicles from both emitter groups.

Assembling a test fleet with the specified emission performance distribution requires vehicles to be obtained with the desired emission performance. For the reformulated gasoline program, such vehicles must be obtained by randomly selecting vehicles with the desired emission performance from the in-use fleet and testing those vehicles in their as-received condition. This method helps assure that the vehicles selected for testing have emission control problems that are representative of in-use emission problems. EPA had considered allowing normal emitting vehicles with intentionally-disabled emission control systems to serve as higher emitting vehicles, but no suitable disablement scheme has been identified and evidence indicating that disabled vehicles would have emission performance representative of inuse higher emitters has

not been found. For these reasons, EPA will not permit higher emitting vehicles to be created by intentionally disabling normal emitting vehicles.

Test vehicles' emission performance will need to be pre-screened to place them in the appropriate emitter group and to assure the proper emissions distribution within the test fleet. Such prescreening tests must be conducted using EPA vehicle certification fuel (Indolene) over the Federal Test Procedure since these were the conditions which were used to generate the data for the in-use emission distribution. Prescreening tests can also be performed using the Clean Air Act baseline gasoline and/or the I/M 240 test procedure. Results from such tests can be correlated with FTP test results with Indolene (as outlined in section 80.62 of the accompanying regulations). (2) Technology Groups. As discussed in Section IV, the development of the complex model revealed that the emissions effect of fuel modifications in normal emitting vehicles varied among the engine and exhaust system technologies present in 1990 model year vehicles. Hence EPA has concluded that the normal emitter test fleet must have a technology distribution that is representative of the technology distribution present in the 1990 model year fleet. The required distribution is shown in Table V.7.

In addition to the technology group criteria of Table V.7, approximately 30 percent of the vehicles selected for each emitter class sub-fleet must be light-duty trucks (LDTs) to reflect the representation of LDTs in the light-duty vehicle fleet. EPA believes that the benefits of providing flexibility in determining the selection of LDTs for the test fleet outweigh the benefits of accuracy achieved by specifying which vehicles from Table V.7 should be LDTs. However, as is also the case for other design elements of the test program, the distribution of LDTs among the normal emitter technology groups is subject to EPA approval.

A number of commenters objected to the application of this technology group distribution to

the higher emitting vehicle subfleet, as was specified in prior proposals. EPA's experience in developing the complex model, as discussed in Section IV and the RIA, confirms that higher emitter emissions tend to be much less dependent on vehicle technology differences than are normal emitter emissions. Therefore, the higher emitting vehicle subfleet need not meet the technology distribution requirement, though a mixture of vehicle models and manufacturers should still be included. The higher emitter subfleet also must meet the 1990 model year and light duty vehicle criteria described previously and, like other elements of proposed testing programs, is subject to EPA approval.

Table V.7.--Test Vehicle Characteristics

Veh. #	Fuel system	Catalyst	Air injection	EGR	Tech. group	Manufacturer
1	Multi	3W	No Air	EGR	1	GM
2	Multi	3W	No Air	No EGR	2	Ford.
3	TBI	3W	No Air	EGR	3	GM.
4	Multi	3W+OX	Air	EGR	4	Ford.
5	Multi	3W	No Air	EGR	1	Honda.
6	Multi	3W	No Air	No EGR	2	GM.
7	TBI	3W	No Air	EGR	3	Chrysler.
8	Multi	3W+OX	Air	EGR	4	GM.
9	TBI	3W+OX	Air	EGR	7	Chrysler.
10	Multi	3W	Air	EGR	5	Toyota.
11	Multi	3W	No Air	EGR	1	Ford.

12	Multi	3W	No Air	No EGR	2 Chrysler.
13	Carb	3W+OX	Air	EGR	9 Toyota.
14	TBI	3W	No Air	EGR	3 Ford.
15	Multi	3W+OX	Air	EGR	4 GM.
16	Multi	3W	No Air	EGR	1 Toyota.
17	Multi	3W	No Air	No EGR	2 Mazda.
18	TBI	3W	No Air	EGR	3 GM.
19	Multi	3W+OX	Air	EGR	4 Ford.
20	Multi	3W	No Air	EGR	1 Nissan

Table V.8--Technology Group Definitions

Tech group	Fuel system	Catalyst	Air injection	EGR
1	Multi	3W	No Air	EGR
2	Multi	3W	No Air	No EGR
3	TBI	3W	No Air	EGR
4	Multi	3W+OX	Air	EGR
5	Multi	3W	Air	EGR
6	TBI	3W	Air	EGR
7	TBI	3W+OX	Air	EGR
8	TBI	3W	No Air	No EGR
9	Carb	3W+OX	Air	EGR

Legend for Tables V.7 and V.8

Fuel System:

Multi = Multi-point fuel injection TBI = Throttle body fuel injection Carb = Carburetted Catalyst:

3W = 3-Way catalyst

3W+OX = 3-Way catalyst plus an oxidation catalyst Air Injection:

Air = Air injection

No Air = No air injection

EGR:

EGR = Exhaust gas recirculation

No EGR = No exhaust gas recirculation

Vehicles must be added to the normal emitter sub-fleet in the order in which they appear in the table. If more than 20 vehicles are included in the normal emitter sub-fleet, then the additional vehicles must be selected starting over with vehicle number one in Table V.7. (3) Number of Test Vehicles. Exhaust emissions are subject to considerable variability due to the complexity of combustion chemistry, engine behavior, and emission control. As a result, substantial statistical uncertainty typically exists in exhaust emission reduction estimates based on a single test program. To reduce this uncertainty, an adequate number of vehicles must be tested for their exhaust emissions. In order to keep statistical uncertainty reasonably low while at the same time limit the test fleet size to reasonable levels, the test fleet for exhaust emissions must consist of a minimum of 20 vehicles. To maintain adequate statistical confidence in test results, however, the distribution of the test fleet among the emitter groups must also be defined so as to minimize statistical uncertainty. As discussed in the April 16, 1992 proposal, differences in VOC, NO<INF>X and toxics emission distributions for in-use vehicles prevents optimization of the size of the emitter groups for all three pollutants simultaneously. EPA is basing the number of

vehicles in each emitter group on their VOC emission performance, based on the reasons discussed in the April 16, 1992 proposal and on the use of VOC emission performance to define emitter groups.

The uncertainty associated with VOC emissions is quite complex. The higher emitting vehicles in various test programs have tended to have significantly greater variability in emission effects than normal emitting vehicles. Hence to minimize statistical uncertainty, a greater proportion of higher emitters should be tested than would be suggested by their contribution to in-use emissions. However, EPA believes that pre-screening and stabilization of higher emitters can reduce their variability to approach that of normal emitters. Therefore, to minimize the statistical uncertainty in the test program the number of normal and higher emitters in the test fleet should represent the contribution of each sub-fleet to total in-use emissions. Since the relative contribution of normal and higher emitters to total VOC emissions is approximately equal (as discussed at length in the RIA), equal numbers of normal and higher emitters must be contained in any test fleet. (4) Waiver Provisions for Different Test Program Requirements. A number of options were discussed in April 16, 1992 which attempted to simplify or minimize the vehicle test fleet requirements while still maintaining the statistical confidence in the results of any test program. Based upon EPA's experience with the programs conducted as part of the complex model development, the test fleet provisions promulgated here represent the minimum possible if adequate statistical confidence in test program results is to be maintained. In fact, EPA believes that many petitioners may desire to test additional vehicles in order to improve their study's statistical power and thereby improve the likelihood that an augmentation petition would be granted. Nevertheless, in some instances petitioners may believe that a more optimal test fleet composition than the one specified above exists for the fuel parameter being tested. In

such cases, petitioners can petition the Administrator to approve a waiver from certain of the requirements in this section relating to the number of test vehicles and their distribution among the normal and higher emitter groups. Any such waiver would have to be obtained in advance of the start of the test program involved. A request for such a waiver must include an adequate justification for the requested change, including the rationale for the request and supporting data and information. EPA reserves the right to require testing of additional vehicles beyond the 20-vehicle minimum where such testing is necessary to evaluate emission effects properly.

8. Data Analysis

a. Weighting of emission test data. The manner in which the test data is to be analyzed must be consistent with the goal that the emission benefits from reformulated gasoline be realized in-use, just as is the case for the exhaust emission complex model itself (as discussed in Section IV). Therefore, augmentation of the models with vehicle testing results must reflect the effects of fuel modifications on emissions of each exhaust pollutant (VOC, NO<INF>X, benzene, 1,3-butadiene, formaldehyde, and acetaldehyde) on 1990 vehicles. The augmentation also must incorporate differences in these effects for vehicles with different emission control technologies and different emission levels. The vehicle selection criteria discussed above are intended to satisfy these requirements without requiring an extremely large test fleet. The results of vehicle test programs will be weighted to reflect the contribution of each emitter class and technology type to in-use emissions according to the procedure described in Section IV for the exhaust emission complex model. b. Data analysis to extend the range of existing model parameters. When extending the range of a fuel parameter already included in the complex model, EPA believes that the data generated through vehicle testing should be combined with the data used to develop the complex model itself. This approach offers several important advantages. First, it

takes full advantage of existing knowledge regarding the effects of the parameter in question on emissions. Second, it reduces inconsistencies between the complex model and the augmentation, thereby simplifying certification and enforcement. Third, it reduces the possibility of petitioners deliberately manipulating the test program to obtain a desired augmentation since the limited data generated by the test program will be combined with the much more extensive data available in the complex model database. The analysis process is described in detail in section 80.48 of today's regulations and in Section IV.G of the RIA. The process requires that the emission effects of the parameter being tested be verified at the extended level while not permitting emission effects of other parameters to be modified from the effects incorporated in the complex model. In addition, the augmentation would only apply to fuels with levels of the parameter being tested that fall outside the range for which the complex model is valid. These safeguards are intended to prevent the results of vehicle testing from being used to alter aspects of the complex model that a fuel supplier or other organization deems undesirable.

c. Data analysis to add new fuel parameters. Vehicle test data for new fuel parameters such as new additives cannot be analyzed in the manner described above for existing fuel parameters. Vehicle-to-vehicle variability can cause significant differences in vehicle responses to parameters already included in the complex model from what the complex model would predict. The analysis method described above would apply these differences entirely to the new parameter, which would allow substantial opportunities to game the testing and model augmentation process. To minimize the risk of gaming and assure proper representation of the effects of new fuel parameters, a different analysis process must be used when augmenting the model with a new fuel parameter. This process is designed to identify the effects of the new parameter itself, including its behavior upon dilution, as well as any interactive effects between

the parameter and existing complex model parameters.

The process itself is described in detail in section 80.48 in today's regulations and in Section IV of the RIA. The modeling process incorporates five techniques to minimize gaming and isolate the actual emission effects of the new parameter being tested. First, the complex model is used to adjust the emissions performance of the test vehicles on the three fuels for any differences in fuel parameters other than the one being tested. These adjustments should be minor, since fuel properties other than the one being tested are required to be nearly identical. Second, the linear and squared terms for the new parameter are determined based on test data from addition fuels 1, 2, and 3 before interactive effects are introduced into the augmented complex model based on the results of testing addition fuels 4, 5, 6, and 7. This approach is used because the direct effects of fuel parameters (represented by the linear and squared terms) are less easily gamed or obscured than are interactive effects since fewer variables are involved. Third, the statistical criteria defined in section 80.57 are used to assure that only statistically significant terms are included in the augmentation.

Fourth, the model must include all terms for the pollutant being modeled that are already included in the complex model. In addition, only the linear, squared, and interactive terms involving the new parameter are permitted to enter the augmentation. The coefficients for the complex model terms will be fixed at the values established in this rule. By not permitting the augmentation to change existing complex model terms, the analysis process reduces opportunities to game to modify complex model effects that the testing organization considers undesirable.

Fifth, augmentations are not permitted for parameters not contained in the complex model but for which measurements exist in the complex model database. Including such parameters in an augmented complex model is likely to result in large changes in complex model coefficients due

to the interrelationship between fuel properties. Such changes would complicate enforcement and might introduce fungibility problems that would diminish the in-use effectiveness of reformulated fuels. Further, EPA's experience in developing the complex model suggests that including such parameters would introduce collinearity problems and exacerbate the risk of test program gaming. Since such parameters were considered for inclusion in the complex model but were rejected based on input from affected parties and EPA staff, EPA has decided not to permit augmentations for such parameters. However, the Agency will consider including such parameters in subsequent revisions to the complex model.

Interactive terms were not permitted to enter EPA's complex models for exhaust toxics, as discussed in Section IV and the RIA. Hence interactive effects on toxics emissions are not permitted in augmentation petitions, unless the test program was intended and specificially designed to investigate such effects. The preceding discussion assumes that the interactive effects identified through testing cannot be traced to a specific cause. If the cause of the interactive effect can be identified, it may be appropriate to determine a greater beneficial augmentation due to the parameter in question than the effects identified through the procedure above or to include an interactive term in the complex model. Therefore, EPA will allow testing of additional fuels to identify the cause of the interactive effect and the magnitude of the effect for representative in-use fuels (again subject to Agency approval regarding the appropriateness of the petitioner's definition of representative gasoline). Petitioners will be required to obtain approval from the Administrator for the proposed additional testing before beginning such testing. Petitioners will be permitted to claim larger benefits for the parameter in question based on the results of such tests, subject to the approval of the Administrator.

For a more complete description of these procedures, the reader is referred to section 80.57 of

the regulations and to Section IV of the RIA.

d. Acceptance criteria. As discussed in Section H, EPA reserves the right to evaluate the quality of testing data submitted in support of petitions to augment the models, to reject test data or analyses submitted to the Agency if such data or analyses are found to be insufficient, flawed, or otherwise deficient, and to include test data or analyses from other sources when evaluating the proposed augmentation to the model.

VI. Phase II (Post-1999) Reformulated Gasoline Performance Standards and NO<INF>X Standards for Reformulated Gasoline

A. Introduction

The Clean Air Act (the Act), as amended in November 1990, establishes a more stringent minimum level of control of ozone-forming VOCs and air toxics emissions from reformulated gasoline beginning in the year 2000 than is required prior to that date. For the first five years of the reformulated gasoline program (Phase I; January 1, 1995 through December 1999), Congress established a minimum requirement of 15% reduction of ozone forming VOCs and toxic air pollutants [CA section 211(k)(3)(B)].<SUP>6 Starting with January 1, 2000 (Phase II), the 15% minimum required reductions are increased to 25%, with the provision that EPA may increase or decrease this level based on technological feasibility, considering cost, but may not decrease it below 20% [CA section 211(k)(3)(B)]. The restriction on increases in

NO<INF>X emissions continues to apply during Phase II of the program.

\6\The numerical performance standard of Sec. 211(k)(3)(B) sets the minimum level of reductions, as it is more stringent than the reductions achieved by the formula fuel in Sec. 211(k)(3)(A).

The regulatory negotiation conducted by EPA for this rulemaking did not address the Phase II

VOC and toxics standards, nor did it address a reduction in NO<INF>X emissions beyond the statutory cap imposed under section 211(k)(2)(A). After analyzing the costs and benefits of various controls, along with other relevant factors, EPA proposed a range of possible Phase II standards for VOC and toxics. Furthermore, based on EPA's view that NO<INF>X reductions were important to achieve attainment of the ozone NAAQS in many nonattainment areas, EPA also proposed a NO<INF>X reduction performance standard for Phase II reformulated gasoline relying on EPA's authority under section 211(c)(1)(A). A more detailed discussion of EPA's Phase II proposals for VOCs, toxics, and NO<INF>X is provided in subsection 2 below. For the reasons described below, EPA has decided to establish per gallon Phase II VOC performance standards of 25.9% for VOC control region 2 (northern areas) and 27.5% for VOC control Region 1 (southern areas).<SUP>7 EPA is also promulgating a per gallon toxics performance standard of 20% for all reformulated gasoline. Reformulated gasoline will also have to meet a 5.5% per gallon reduction in emissions of NO<INF>X. EPA has also established more stringent VOC, toxics, and NO<INF>X performance standards where a refiner or importer complies on average, as well as minimum per gallon standards, as explained in section C below.

\7\The 27.9% VOC performance standard for VOC control region 1 is measured against the statutory baseline gasoline, which has an RVP of 8.7 psi. This amounts to a 17.7% VOC reduction when measured against a baseline gasoline with RVP of 7.8 psi.

1. Statutory Requirements

Section 211(k)(1) requires that reformulated gasoline achieve the greatest reductions possible in volatile organic compounds (VOCs) and toxics emissions, ``taking into consideration the cost of achieving such emission reductions, any nonair-quality and other air-quality related health and environmental impacts and energy requirements. Specifically, section 211(k)(3)(B) of the Act

requires that, in the year 2000 and beyond, ``aggregate emissions of ozone-forming volatile organic compounds from baseline vehicles<SUP>8 when using reformulated gasoline shall be 25 percent below the aggregate emissions of ozone forming volatile organic compounds from such vehicles when using baseline gasoline<SUP>9." Similarly, a 25% reduction in emissions of toxic air pollutants is required. The Act also specifies that the Administrator may adjust the 25 percent reduction level to provide for lesser or greater reductions based on technological feasibility, giving consideration to the cost of achieving such reductions. In no case can the required reduction be less than 20 percent. The Act further provides that emissions of oxides of nitrogen (NO<INF>X) cannot increase as a result of the use of reformulated gasoline. These VOC and toxics reductions and NO<INF>X limit are known as the Phase II reformulated gasoline standards.

\8\According to section 211(k)(10)(A) of the Act, ``baseline vehicle" means representative model year 1990 vehicles. \9\The formulation for summertime baseline gasoline is defined in section 211(k)(10)(B) of the Act. See further discussion of baseline emissions in section IV.

Section 211(c) of the Act allows the Administrator to regulate fuels or fuel additives if ``any emission product of such fuel or fuel additives causes, or contributes to, air pollution which may reasonably be anticipated to endanger the public health or welfare." Section 211(c)(2) further provides that EPA cannot control these fuels and fuel additives ``except after consideration of all relevant medical and scientific evidence available * * *, including consideration of other technologically or economically feasible means of achieving emissions standards." In addition, EPA must find that the prohibition ``will not cause the use of any other fuel or fuel additive which will produce emissions which will endanger the public health or welfare to the same or greater degree than the use of the [regulated fuel/fuel additive]." EPA has elected to use this

authority to require reformulated fuels to also achieve NO<INF>X reductions in order to reduce ozone formation, based on scientific evidence regarding the benefits of NO<INF>X control and on the cost-effectiveness of NO<INF>X reductions. The determination of the need for, scientific justification of, and cost-effectiveness of NO<INF>X control is presented in the RIA and summarized in subsection C.2 below.

2. Proposal

EPA proposed a range of VOC and toxics performance standards for Phase II reformulated gasoline, covering a variety of options for setting these standards [see the Notice of Correction for the Proposed Rule 58 FR 17175 (April 1, 1993)]. The proposed VOC standards ranged between 29.7 and 37.7 percent reduction in emissions for VOC control region 1 areas (Class A and B, the southern areas of the country) based on a baseline fuel with an RVP of 8.7 psi<SUP>10, and between 26.7 and 34.7 percent reduction for VOC control region 2 areas (Class C, the northern areas of the country) [58 FR 17178, 17179, 17180 (April 1, 1993)]. These percentage reductions are in comparison to the emissions performance of baseline vehicles operating on baseline gasoline; the proposed version of the complex model was used to establish a fuel's emissions performance. In proposing the range of values EPA considered the costs of VOC control, the cost-effectiveness of the controls, the health and environmental effects, energy impacts, and technological feasibility.

\1\0Relative to a baseline fuel including an RVP of 7.8 psi, the proposed VOC standards ranged between 20.7 and 31.7 percent reduction.

EPA's analysis showed that fuels meeting the proposed VOC and toxics standards were expected to show no increase in NO<INF>X emissions, and in fact would likely achieve some reduction in NO<INF>X. Based on the expected benefits of NO<INF>X reduction, and

considering various other factors, EPA also proposed NO<INF>X emissions reduction standards for Phase II reformulated gasoline based on the authority of section 211(c)(1)(A) of the Act. The proposed NO<INF>X standards ranged from 0 to 14.8 percent reduction for VOC control region 1 (southern areas) and 0 to 15.4 percent reduction for VOC control region 2 (northern areas) [58 FR 17178-9 (April 1, 1993)]. Again, the NO<INF>X emissions performance of a fuel would be determined using the proposed complex model. The range of proposed standards was based, in part, on different levels of potentially acceptable cost-effectiveness as well as whether the cost-effectiveness was calculated based on reductions in NO<INF>X emissions alone or on the combined reduction in VOC and NO<INF>X emissions.

EPA proposed alternative VOC standards that would apply depending on whether EPA adopted a NO<INF>X reduction standard. These were based on changes in the cost-effectiveness analysis from combined VOC plus NO<INF>X emissions reductions. As explained in the proposal, measures taken to achieve the NO<INF>X reductions under this option would result in VOC emission reductions incremental to those obtained under the proposed VOC only standards, which were based solely on the cost per ton of VOC reduced. These additional VOC emission reductions obtained through a combined VOC plus NO<INF>X standard presented the option of setting a standard for larger VOC reductions. EPA analyzed the costeffectiveness of a more stringent VOC standard in connection with a NO<INF>X standard, and proposed a range of values depending on the target cost-effectiveness level: for southern areas, 29.7-40.2 percent based on an 8.7 psi baseline RVP (20.7-33.8 percent reduction based on a 7.8 psi baseline RVP); for northern areas, 26.7-37.3 percent reduction.

In analyzing potential VOC and NO<INF>X reduction requirements, EPA looked at two potential cost-effectiveness targets: $5,000/ton and $10,000/ton. These figures were selected as

representative of the range of cost-effectiveness for controls which would be incurred by many ozone nonattainment areas in achieving attainment. In addition, they reflected higher cost-effectiveness values than those for any thenexisting federal nationwide motor vehicle or motor vehicle fuel control programs.

Finally, EPA proposed a toxics emissions reduction standard between 20 and 25 percent. The 25 percent reduction standard proposed was based on the level specified in section 211(k)(3)(ii) of the Act. In the proposal, EPA recognized that while on average this level of toxics control was cost effective, it could be highly cost ineffective for some refiners. The statutory minimum 20 percent reduction standard was proposed as an alternative to allow refiners further flexibility in meeting the VOC and NO<INF>X standards (and for some to reduce the need for capital intensive modifications specific to toxics control), under circumstances where in most cases large reductions in toxics emissions would automatically result from the VOC and NO<INF>X controls. 3. General Comments Received on Proposal EPA received several comments recommending a reproposal of the Phase II standards once the complex model was finalized and EPA could develop a single standard for each pollutant. One comment stated that the construct of the complex model will have a significant effect on the standards, and it was therefore not possible to comment on the costs or performance of the Phase II standards as proposed (since they were not based on the final complex model). Others commented that it was improper to establish standards until the model that predicts benefits exists. EPA does not believe it is necessary to repropose these standards, since the proposal presented a range of values for the standards and outlined all of the options that were considered. The final standards were derived based on the final complex model, so the standards include the effect of the complex model on the emissions reductions predicted. EPA had proposed, and it was agreed in Reg-Neg, that the

Phase II standards would be promulgated with the complex model.

Briefly described below are the factors EPA considered in setting the standards being promulgated today, the methodology used in determining the cost-effectiveness of fuel controls, and the reasoning used in determining the standards. The full analysis leading to the final standards is more thoroughly discussed in section VI of the regulatory impact analysis (RIA) associated with this rulemaking.

B. Factors Affecting Selection of the Phase II Standards

In determining the Phase II reformulated gasoline standards, EPA considered the health, environmental, and energy impacts, as well as the cost and the technological feasibility of reformulating gasoline to attain emission reductions of VOCs, toxics, and NO<INF>X. EPA's analyses of these factors are discussed briefly below, and in detail in the RIA.

1. Health and Environmental Impacts

The purpose of the reformulated gasoline program is to reduce motor vehicle emissions of ozone forming VOCs and certain specified toxic air pollutants in those areas most in need of such reductions. As discussed above, EPA is also reducing ozone forming NO<INF>X emissions from RFG as a part of this rulemaking. EPA measured the health and environmental benefits of the reformulated gasoline program in terms of the number of tons of VOC, NO<INF>X, and toxics reduced, since the Act specifies mass-based emissions reductions. The benefits of toxics reductions were further evaluated on the basis of the number of cancer incidences avoided, since this is a common measure of the effectiveness of toxics control. The reader is directed to section C below for quantified estimates of these reductions.

The benefits of ozone reduction will be gained through the reduction of both VOC and

NO<INF>X emissions. Ambient ozone levels and the effect of VOC emission reductions on these levels vary from city to city, making it difficult to quantify the benefits of the VOC reduction beyond tons of emissions reduced. In general, reductions in VOC emissions will improve the air quality of most affected areas and thereby reduce the negative health impacts of exposure to high levels of ozone. Visibility and other environmental measures are also improved through reductions in emissions of ozone precursors. Similar benefits will be gained through reductions in NO<INF>X emissions. The reader is directed to subsection C.2 for further discussion on the health and environmental benefits of NO<INF>X control. Reducing ozone levels in highly populated urban areas would help to reduce short-term health effects such as impaired lung function, cough, nausea, chest pain, throat irritation, increased susceptibility to respiratory infection, and increased sensitivity of asthmatics to allergens (e.g., pollen) and other bronchoconstrictors. Long-term health effects of exposure to ozone include accelerated aging of the lungs, reduced elasticity of the lungs, scarring of lung tissue, and permanent reductions in baseline lung function. Although the reformulated gasoline program is concentrated in urban areas, some reformulated gasoline will be used in rural areas as a result of spillover in the distribution system. Reducing ozone levels in rural areas would enhance agricultural crop yield, currently estimated to be reduced by as much as $2-3 billion per year by existing ozone concentrations.<SUP>11 In addition, lower ozone levels would help reduce damage to forest ecosystems which experience lower tree growth rate, foliage damage, and increased susceptibility to stress (e.g., insects, disease, drought) caused by current tropospheric ozone levels.<SUP>12

\1\1U.S. EPA, ``Air Quality Criteria for Ozone and Other Photochemical Oxidants," EPA Report No. EPA-600/8-84/020A-E, p.1- 27.

\1\2Ibid., p. 7-1 through 7-4.

Reductions in mobile source emissions of the air toxics addressed in the reformulated gasoline program (benzene, 1,3-butadiene, formaldehyde, acetaldehyde, and POM) may result in fewer cancer incidences. A number of adverse noncancer health effects have also been associated with exposure to air toxics, particularly with higher level exposures experienced in particular microenvironments such as parking garages and refueling stations. These other health effects include blood disorders, heart and lung diseases, and eye, nose, and throat irritation. Some of the toxics may also be developmental and reproductive toxicants, while very high exposure can cause effects on the brain leading to respiratory paralysis and even death. The use of reformulated gasoline meeting the Phase II standards will likely help to reduce some of these health effects, as well. A more thorough discussion of the variety of possible non-cancer effects of concern from exposure to air toxics is contained in EPA's Motor Vehicle-Related Air Toxics Study.<SUP>

\1\3EPA document 420-R-93-005, April 1993.

The emissions reductions and cancer incidences avoided as a result of today's standards are discussed below in section C. In addition to the benefits from reductions in emissions of VOC, NO<INF>X, and toxics, other environmental benefits will be realized as a result of the use of reformulated gasoline. Emissions of carbon monoxide will decrease as the result of adding oxygen to the fuel, to the benefit of areas out of attainment for this air pollutant and to human health in general.<SUP>14 In addition, since reformulated gasoline is projected to cost more than conventional gasoline, it is possible that consumers will purchase and, thus, use less gasoline, resulting in fewer overall emissions due to mobile sources.

\1\4Most of this benefit will occur as a result of the use of oxygen in Phase I RFG, not from the Phase II reductions.

2. Energy Impacts

Production of Phase II reformulated gasoline subject to performance standards for VOC, NO<INF>X, and toxics will require an increase in the amount of energy used at the refinery. An estimate of the energy used depends on many factors, including how the energy balance is evaluated, the type and source of oxygenate, the refinery configuration, and the reformulation approach. Determining an exact energy increase associated with reformulated gasoline production (on the basis of a constant level of gasoline energy produced) is difficult. As later sections of this document will show, the standards for VOC and NO<INF>x reduction promulgated today will likely be met largely through reductions in the sulfur content and Reid vapor pressure (RVP) of the fuel. The process used to remove sulfur from gasoline, hydrodesulfurization, is an energy intensive process; mainly due to the need for and consumption of hydrogen. The energy impact will depend on the sulfur level of the crude used by the refinery and the level of sulfur control necessary for that refinery to meet the standards. Reducing the RVP of the fuel requires removal of the lighter compounds in the fuel, also an energy consuming process. Overall, it is expected that the energy consumption by refineries in producing Phase II reformulated gasoline will increase slightly (perhaps a couple percent) over the level of energy used to make Phase I RFG, but the magnitude of this increase is difficult to measure due to the many variables involved.

3. Technological Feasibility

EPA also considered the technological feasibility of producing fuels to meet the Phase II standards. EPA believes that the refinery modeling results (from which the fuel parameter control costs were estimated) indicated that it is technologically feasible to make the fuel parameter changes that were analyzed in developing the standards. The refinery models utilize only well-developed, demonstrated, commercially available technologies, and are designed to

only model fuels within the limits of these technologies.<SUP>15 Given the cost incentives created by this rulemaking, in all likelihood new technologies will be developed between now and the year 2000 which will reduce the costs for certain types of fuel parameter changes. Thus, EPA believes that the determination of fuel parameter control costs using the results of the existing refinery models is reasonable, that the costs generated are perhaps conservative, and that the technological feasibility of producing such emission-reducing fuels is justifiable. This position was supported by many of the comments received. While other commenters questioned the costs used in developing the proposal (as discussed in subsection 4.b), no comments questioned the technological feasibility of these refinery configurations.

\1\5See the RIA for additional details on the refinery models used for this analysis.

Because the standards promulgated today will not take effect until the year 2000, and because all the processes needed to produce complying fuels are already commercially available, EPA does not believe that lead time will be an issue in achieving the required emissions reductions.

4. Fuel Safety and Driveability

EPA evaluated safety concerns associated with the use of low RVP fuels and found no significant negative impacts, as discussed in the RIA. Comments also raised concerns about driveability problems arising from the use of low RVP fuels. They raised concerns that EPA's analysis in the proposal did not address spring months (the transition time to the VOC control period), September RVP fuel sold in October, and low RVP gasoline sold in low temperature areas near nonattainment areas. While neither EPA nor any other organization conducted driveability testing at low ambient summer temperatures, EPA has looked at the actual vapor pressure of fuels currently in production, as documented in the draft RIA.<SUP>16 Based upon a comparison of actual vapor pressures, EPA believes that 6.5 psi RVP fuel in the summer

should have similar driveability to current winter fuels. At this time EPA believes there should be no significant driveability problems with gasoline at an RVP level down to 6.5 psi. Until such time as data can be gathered to more fully evaluate the driveability impacts of low RVP fuels, EPA believes that 6.5 psi may present a practical lower limit below which the existence of adverse driveability impacts is unknown. Discussions with representatives of both the oil and automotive industries reflected a similar uneasiness in going below 6.5 psi RVP given the lack of data at lower levels. However, the standards for Phase II RFG are performance based standards. As a result, flexibility exists for refiners to meet the Phase II standards, without reducing the RVP of the gasoline below 6.5 psi.

\1\6``Draft Regulatory Impact Analysis for the Notice of Proposed Rulemaking of the Complex Model, Phase II Performance Standards, and Provisions for Renewable Oxygenates," February 5, 1993.

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5. Cost-Effectiveness of Emissions Reductions a. Introduction. For purposes of this discussion, EPA defines costeffectiveness as the ratio of the incremental cost of a control measure to the incremental benefit, e.g., tons of VOC or other emissions reduced. Considering cost-effectiveness allows the Agency to develop a relative ranking of various ozone and toxics control strategies so that an environmental goal can be achieved at minimum cost. As the costeffectiveness of an emission reduction strategy increases, it may be possible to achieve similar, substantial emission control in other ways (e.g., through other regulatory programs) at the same or lower cost per unit of benefit. EPA therefore considered cost-effectiveness in deciding what VOC, NO<INF>x, and toxics control, if any, to impose beyond the minimum levels required under section 211(k)(3)(B). One commenter recommended that EPA evaluate the cost-effectiveness of this program separately for small and large refiners, and also that EPA

consider granting small refiners more time to comply with the requirements (as is allowed by California for California reformulated gasoline). The California reformulated gasoline program requires all refiners selling gasoline in the state to produce reformulated gasoline, and thus does not afford any flexibility to refiners, large or small. The federal RFG program, however, does not require 100% production of RFG in any region, nor does it require that every refiner produce RFG. Hence, small refiners can choose not to produce RFG and instead supply conventional gasoline if the costs of complying with the program are too burdensome. For those small refiners electing to produce RFG, the option to select between per gallon and averaging standards, as well as the ability to set their own baselines, gives them flexibility to meet the standards in the manner that is most cost effective for them. Furthermore, the enforcement structure is based on a single set of standards for Phase II RFG. Allowing some refiners to comply with a different set of standards would require additional and more complicated enforcement provisions, and could jeopardize the fungibility of reformulated gasolines.<SUP>17 Since EPA believes that the existing program provides sufficient flexibility to small refiners, there is no need to pursue multiple enforcement programs. See section XV for additional discussion of the impact of this rule on small refiners.

\1\7For Phase I RFG, the standards are set at the statutory minimum for both VOCs and toxics. EPA could not lawfully allow small refiners less stringent standards or more time to comply with the Phase I standards.

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b. Fuel Parameter Control Costs. Fuel parameter control costs and interrelationships between fuel parameters are integral parts in the evaluation of the cost-effectiveness of Phase II RFG controls. The costs and interrelationships used to develop the VOC and toxics standards were estimated from the results of refinery modeling performed by Bonner and Moore Management

Science,<SUP>18 by Turner, Mason, and Co. for the Auto-Oil Air Quality Improvement Research Program;<SUP>19 by Turner, Mason, and Co. for the Western States Petroleum Association (WSPA);<SUP>20 and by EPA in-house (using the Bonner and Moore refinery model).<SUP>21 EPA used these regional refinery models to estimate the cost and interrelationships of various fuel parameter controls. The final average nationwide costs were obtained by weighing the regional values by the estimated fraction of total reformulated gasoline (RFG) production in each region.

\1\8Bonner and Moore Management Science, ``Study of the Effects of Fuel Parameter Changes on the Cost of Producing Reformulated Gasoline," Prepared for EPA under contract through Southwest Research Institute and the National Institute for Petroleum and Energy Research. This data, as well as data generated by EPA inhouse, was made available to the public through the following document: ``DOE and API Phase II Cost Estimates," EPA Memorandum from Lester Wyborny, FSSB, to the Air Docket, November 4, 1993. \1\9``Costs of Alternate Gasoline Reformulations, Results of U.S. Refining Study," Turner, Mason & Co. for the Economics Committee of the Auto/Oil Air Quality Improvement Research Program, April 1992.

\2\0``WSPA Study of the Cost Impacts of Potential CARB Phase 2 Gasoline Regulations," Turner Mason & Company for the Western States Petroleum Association, November 18, 1993. \2\1``Aromatics and E200 Reformulation Costs," Memorandum from Lester Wyborny, EPA, to the Air Docket, December 10, 1993.

Many comments were received on the costs used in the proposal. Some of these comments, and EPA's response, are summarized here, while the RIA contains a complete discussion and analysis of the comments received. Several commenters questioned the appropriateness of using independent refinery models to generate costs for control of individual parameters. In addition,

they questioned the aggregation of results from regional models to generate national average costs, and recommended instead using a model from the region likely to realize the highest costs for producing reformulated gasoline (PADD 1). While using regional models to estimate national average costs requires an acknowledgment of the inherent limitations in such models, EPA believes that it is appropriate to use them for the purpose of determining the costs to produce reformulated gasoline. The limitations and assumptions made in using the refinery models and the results of this analysis are discussed in detail in the RIA.

The manufacturing cost of producing gasoline is the sum of the capital recovery cost and the operating costs, adjusted for changes in the energy content of the fuel (to represent consistent fuel economy). VOC control is mandated only during the high ozone season, and thus all costs were allocated to the high ozone season in the refinery modeling work. In contrast to VOC control, toxics control and the benefits from reductions in toxics emissions occur year-round. Although the costs of toxics control should be determined on an annual basis, EPA used the same costs that were used for the VOC analysis, since it had been determined in the RIA (and supported by many comments received) that additional toxics control would be highly cost-ineffective. The level of either VOC or toxics control that is cost effective is not greatly affected by the accuracy of the costs, due to the magnitude of reductions achieved.

Some comments received on the proposal raised the concern that this method of determining costs did not accurately reflect all of the costs of the program, since the ``compliance costs" for record keeping and enforcement, as well as costs incurred by pipelines or other entities, were not included. While it is true that ``compliance costs" will be incurred as a result of the reporting and enforcement requirements of Phase II RFG, EPA does not anticipate the costs to be greater than those incurred by the Phase I RFG program. Refiners will already be supplying the information

required by EPA for Phase I, and will continue to do so under Phase II. Hence, there is no additional cost of compliance to add to the costs of Phase II RFG. Other factors affecting incremental fuel parameter control costs include the amount of reformulated gasoline produced by the refinery and the effects of fuel parameter changes on fuel economy. Because producing reformulated gasoline reduces flexibility in refinery operations, the cost of producing such fuels increases with the amount of reformulated gasoline that is produced in a given refinery. In this analysis, EPA used a scenario of RFG production based on participation in the reformulated gasoline program by the nine mandated areas, those areas which had opted into the program as of August 14, 1993 (the close of the comment period on the proposal), the entire Northeast Ozone Transport Region (including both attainment and nonattainment areas), and all other ozone nonattainment areas. This scenario was chosen to represent the Phase II RFG program that would result if all eligible areas opted into the program. Since the Ozone Transport Commission has not announced plans to opt-in to the RFG program, and the only additional nonattainment areas that have opted into the program since August 14 are those located in Kentucky, the volume of RFG production used for this analysis is overstated by about 20 percentage points. As a result, the cost estimates are higher than will likely be experienced, since use of RFG in the entire Northeast would severely limit refinery production in that region, incurring somewhat higher costs to individual refiners, particularly to those refiners which for economic reasons would choose not to produce RFG and merely continue producing conventional fuel.

EPA evaluated the costs for incremental control levels for a variety of fuel parameters. This evaluation revealed that the greater the level of control, the higher the costs of achieving that level. Complete information on the development of the individual parameter costs is provided in the RIA.

Several comments were received questioning the validity of evaluating the cost-effectiveness of Phase II RFG on a parameter by parameter basis. The recommended alternative was to evaluate the cost of producing a gasoline meeting the standards for a variety of refinery configurations, and to use this information to determine the costeffectiveness of the standard. As explained in the RIA, EPA determined that it was appropriate to evaluate cost-effectiveness on an incremental basis to properly compare fuel controls to other forms of emission control.

c. Emissions reductions.--In determining the emission reductions and the associated cost-effectiveness of VOC control, EPA employed a convention typically used in estimating the benefit of both mobile and stationary source VOC controls. This convention requires the determination of cost-effectiveness on the basis of annual tons of VOC reduced. Thus, even though VOC emission reductions required under section 211(k) occur only during the high ozone season, the convention is to calculate the cost of the fuel parameter control per ton of VOC removed as if the high ozone season emission reductions were spread over the whole year. Comments were received that questioned the appropriateness of evaluating the cost-effectiveness on an annualized tons reduced basis rather than on a summer tons reduced basis, since the program is a summer program. The purpose of applying this convention to the evaluation of Phase II RFG was to allow direct comparison of the cost-effectiveness of this program with the costeffectiveness of other VOC control strategies, which is typically calculated on a year-round basis. The only other appropriate alternative would be to recalculate the cost-effectiveness of all other programs on the basis of cost per ton of control during the high ozone season, the only time period when emission reductions for the purposes of ozone control are of any significant value. Reductions in emissions of both exhaust and evaporative VOC are determined for a given fuel parameter change using the complex model. As discussed in earlier sections, the complex model

statutory baseline emissions are based on 1990 vehicle technology, and compliance with the Phase II standards is measured relative to these base emissions. As explained in the RIA, EPA determined that the olefin level specified in the statutory baseline was not representative of the actual olefin level of gasoline in 1990. Phase I RFG includes no specific limits on olefins, and thus refiners can meet Phase I standards (under the complex model) by controlling any fuel parameters. However, refiners whose olefin baseline is significantly higher than the statutory level may need to reduce olefins to meet the no NO<INF>x increase requirement, putting them at a competitive disadvantage because olefin control is costly. Hence, using data from Bonner and Moore modelling as well as fuel surveys from cities across the country, the baseline olefin level was reevaluated and set at 13.1 vol% for the purposes of determining cost-effectiveness.

Although the standards require reductions for baseline vehicles relative to the emissions from the statutory baseline fuel, the costeffectiveness of a given fuel parameter control is measured based on actual, i.e., in-use emission reductions. For this reason, EPA determined the cost-effectiveness of fuel parameter changes relative to the incremental in-use emissions. The baseline in-use emissions were determined for 2003, a typical post-1999 year, using MOBILE5a with enhanced inspection and maintenance (I/M), as discussed in section IV.<SUP>22 Exhaust and evaporative percent reductions for in-use emissions are determined separately by applying the percent reduction in emissions predicted by the complex model to the in-use emissions, and then totalled to get total in-use emissions reductions. The cost, emissions reductions, and cost-effectiveness of incremental changes in fuel parameters for Phase II RFG is calculated relative to Phase I RFG.

\2\2Following the precedent set in the proposal, the in-use baseline for VOC Control Region 1 areas included an RVP of 7.8 psi. The standards set today are based on reductions relative to the

statutory baseline fuel with an RVP of 8.7 psi, however

To determine the cost-effectiveness of the toxics standard, EPA employed the convention of basing cost-effectiveness on the number of cancer incidences avoided. The number of cancer incidences avoided is determined based on the reduction in emissions of each regulated air toxic. The complex model was used to calculate the annual reduction in both exhaust and evaporative emissions of each toxic for each fuel reformulation. Each toxic emission has a different unit risk factor, defined as the number of cancer incidences per year per gram-per-mileemission per person. Therefore, the emissions of each toxic pollutant were converted to an estimate of annual cancer incidences using the risk factor for that pollutant and the population of the participating reformulated gasoline areas. The total cancer incidences resulting from the total toxics emissions were then calculated by summing the cancer incidences for the individual toxics.

d. Cost-effectiveness. The costs and emissions reductions for each parameter change are combined to determine the incremental costeffectiveness ($/ton) of each level of control, assigning all of the costs to the control of the pollutant of concern (VOC or NO<INF>X). Several comments were received regarding this method of establishing cost-effectiveness. One comment suggested that refiners are likely to reduce parameters to levels lower than the mandated limits to ensure compliance with the standards. Thus it was suggested that the cost analysis should be based on a marginal increase in the standard to determine the true cost-effectiveness of the program. EPA's costeffectiveness analysis is inherently an averaging analysis, however, since the cost estimates are based on the responses of average regional refineries to changes in fuel composition. Averaging allows refiners to be high or low for any batch of fuel, as long as their average meets the standard over the course of the entire compliance period. Measurement error goes both above and below the true values on any given

batch of fuel, but should average zero over the course of many batches. As a result, there is no need for a compliance margin in setting an averaging standard.

EPA proposed a range of VOC and NO<INF>X emission reduction standards based, in part, on two possible benchmarks for costeffectiveness, $5,000/ton and 10,000/ton.<SUP>23 Several commenters stated that $5,000/ton was most appropriate, particularly in light of the inaccuracies in the cost analysis. Some commenters believed that $5,000/ton was too high compared to alternate control strategies, while others stated that this was reasonable compared to other strategies currently required.

\2\3As discussed later, EPA considered a number of issues, including flexibility of refiners and burden to the industry, in addition to cost-effectiveness when setting the Phase II RFG standards.

Upon review of the costs of other VOC and NO<INF>X control programs (see subsections C.1 and C.2 below), EPA believes that a costeffectiveness benchmark of $10,000/ton is too high at this point in time and that a cost-effectiveness of approximately $5,000/ton is more appropriate for the Phase II VOC standard and the accompanying NO<INF>X standard. The standards presented today fall within this guideline. The cost-effectiveness of toxics control was similarly determined as the ratio of the total incremental cost for the incremental reduction in emissions to the total tons of toxics reduced. The costeffectiveness of toxics control was also calculated as the ratio of total costs to incremental reductions in cancer incidences. EPA's proposal did not include any benchmark limits for the costeffectiveness of toxics control, but did acknowledge that in most cases control above the statutory minimum was not cost-effective. This conclusion was supported by the comments received, and by the final analysis presented here.

C. Phase II Reformulated Gasoline Standards and NO<INF>X Standards for Reformulated

Gasoline

The following sections explain the development of the VOC standards for Phase II reformulated gasoline, and the NO<INF>X standards EPA is setting for gasoline sold in RFG areas after 1999. The final standards are summarized in subsection 3 below.

1. VOC Standards Development

Table VI-1 shows the incremental fuel parameter control costs, emissions reductions, and cost-effectiveness calculated by EPA for use in setting the VOC emissions standards. The specific fuel parameter changes shown in the table are only examples; refiners may achieve the required standards by any combination of fuel component controls resulting in the required emissions performance. EPA received conflicting comments regarding which parameters would likely be controlled to meet the proposed standards in a cost effective manner. As demonstrated in the RIA, EPA has used all available information to determine which parameters can be controlled in a cost effective manner to achieve VOC emission reductions.

Table VI-1 --Fuel Parameter Control Costs and VOC Reductions\1\

Fuel parameter	Incremental cost (	Cumulative reduction	Incremental cost-eff.	Incremental control	cents/gal) to phase I
		(%)	($/ton)	($/ton)	
Phase I--RVP: 8.0 psi, Oxygen: 2.1wt%, Benzene: 0.95%:					
RVP to 7.1 psi..	0.18	22.9	400	400	
RVP to 6.7 psi..	0.08	25.5	600	400	

Sulfur to 250

ppm..... 0.12 \2\26.1 3,700 600

Sulfur to 160

ppm..... 0.56 27.1 11,000 1,300

Sulfur to 138

ppm..... 0.24 27.4 19,000 1,600

Sulfur to 100

ppm..... 0.52 27.8 24,000 2,300

Olefins to 8.0

vol%..... 0.78 26.2 (-) 3,700

Aromatics to 20

vol%..... 2.01 27.8 24,000 6,000

Oxygen to 2.7

vol%..... 0.61 28.2 28,000 6,600

Olefins to 5.0

vol%..... 2.77 27.4 (-) 11,000 E300 to 88%..... 0.35 27.4 48,000 11,000 E300 to 91%..... 2.01 27.5 198,000 14,000 E200 to 44%..... 0.38 27.7 37,000 14,000 E200 to 47%..... 1.32 28.4 36,000 15,000 E200 to 50% 2.97 29.0 96,000 18,000 \1\Based on costs and emissions reductions for VOC control region 2 (northern areas). Assumes all costs allocated to VOC control. \2\RVP control down to 6.5 psi, the limit considered reasonable at this point in time for driveability purposes, would increase this value to 27.2% at a similar cost-effectiveness level.

As the information in the Table VI-1 shows, RVP control down to 6.7 psi achieves virtually all of the VOC emission reductions that are achievable at less than $5,000 per incremental ton of

VOC reduced.<SUP>24 Sulfur can be reduced to a level of approximately 250 ppm at an incremental cost-effectiveness of less than $5,000 per ton, gaining an additional 0.6% VOC reduction, to achieve a total reduction (on average) of 26.1%. RVP could also be reduced further to 6.5 psi, the level currently considered a reasonable limit for driveability purposes, to obtain an additional 1.1% reduction (for a total of 27.2%). Incremental changes in fuel parameters other than RVP have only a marginal effect on VOC emissions and can be very costly; less than an additional one percent reduction would be achieved at a significantly higher incremental cost of over $10,000/ton VOC. In spite of the uncertainty in the cost estimates used, the level of VOC control that is cost effective is relatively insensitive to variations in cost due to the fact that anything other than RVP and the first increment of sulfur control causes the costs to escalate dramatically, making control of other parameters cost ineffective.

\2\4Note that the cost of this level of reduction incremental to the emission reductions achieved by Phase I RFG is significantly less than $1,000/ton VOC.

The cost-effectiveness of VOC control in Phase II RFG presented in Table VI-1 has been compared to the cost-effectiveness of other stationary and mobile source VOC control strategies. As summarized in the RIA, a review of the estimated cost-effectiveness of controlling VOC emissions from stationary sources yielded a wide range of values. Many of the existing VOC control strategies have minimal costs or even result in savings. However, a number of VOC control options have significant costs associated with them. For example, the estimated cost-effectiveness of reducing emissions from automobile and light truck coating operations in assembly plants is $1,000-4,000/ton VOC. Reducing emissions from the production of pneumatic rubber tires is estimated to cost between $150 and $18,800 per ton of VOC reduced, depending on the operation to which control is applied. Control of emissions from floating roof

tanks used for storage of petroleum liquids can cost up to $3,700/ton VOC reduced. Reducing emissions from the production of high density polyethylene, polypropylene, and polystyrene resins can cost between $1,000 and $3,000/ton VOC reduced depending on the level of control.

Control of VOC emissions from mobile sources similarly is estimated (see the RIA) to result in a wide range of cost-effectiveness values, depending on the type of program and level of control achieved. Enhanced inspection and maintenance (I/M) programs will cost between $900-1,700/ton VOC reduced, while basic I/M was estimated to cost $5,400/ton VOC.<SUP>25 The Tier 1 standards for light duty vehicles (already implemented for the 1994 model year) were estimated to cost about $6,000/ton VOC.

\2\5``Inspection/Maintenance Program Requirements," Final Rule, 57 FR 52984, November 5, 1992.

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2. NO<INF>X Standards Development While section 211(k)(2)(A) of the Act specifies that there be no net increase in NO<INF>X emissions (over baseline levels) resulting from the use of reformulated gasoline, both a National Research Council study<SUP>26 and a study prepared for EPA<SUP>27 have indicated that additional NO<INF>X reductions could significantly reduce ozone formation in many areas. Gasoline vehicles contributed 20-35% of total urban NO<INF>X inventories in 1990 and are expected to contribute similar amounts in 2000.<SUP>28 As identified in subsection A.1 above, section 211(c) of the Act gives the Agency broad regulatory authority to regulate motor vehicle fuel quality if any emission product of such fuel causes or contributes to air pollution which may reasonably be anticipated to endanger public health or welfare. Based on the reports cited above, other EPA work in ambient ozone analysis, and the authority granted EPA under section 211(c), EPA proposed setting a NO<INF>X emission reduction standard in connection with the Phase II standards to further

reduce ozone formation during the high ozone season.

\2\6 ``Rethinking the Ozone Problem in Urban and Regional Air Pollution," National Research Council, December 18, 1991. \2\7 ``Modeling the Effects of Reformulated Gasolines on Ozone and Toxics Concentrations in the Baltimore and Houston Areas," prepared for EPA,OPPE,APB by Systems Applications International, September 30, 1992.

\2\8While Tier I vehicles, which have lower NO<INF>X emissions than conventional vehicles, will be entering the fleet, they will have only had five years to displace older, dirtier cars by 2000. Anticipated growth in vehicle miles travelled will offset any emissions benefits gained from the use of cleaner cars.

A number of aspects of the RFG program lead naturally to a focus on NO<INF>X control. First, Phase II RFG is focused on the worst ozone nonattainment areas. Second, these areas will be required to use VOC controlled Phase II RFG only during the time of the year when control is needed (the summer months). Third, special fuel distribution for RFG will already be in place in these areas; many of the costs of producing and distributing this new gasoline will have been incurred as a result of the Phase II program. Fourth, EPA has shown (in the RIA and the following sections) that gasoline can be refined cost-effectively to reduce NO<INF>X emissions.

EPA sees little benefit in creating a second gasoline program, which would likely differ only slightly from RFG in the geographic areas affected, to control NO<INF>X emissions. A large segment of the industry is already making the changes necessary to comply with the Phase I RFG standards in 1998 relative to the statutory baseline for sulfur and olefin levels (and all other parameters defined). Therefore, many refiners will be assessing the need for sulfur and olefin control in the next few years to ensure they comply with the no NO<INF>X increase requirement of the Act. Promulgated separately, a NO<INF>X standard would require refiners to

make changes to their refineries in addition to those already made to comply with Phase I RFG and the Phase II VOC and toxics standards, perhaps making some of the original refinery changes obsolete. By enacting a NO<INF>X emissions reductions program at this time EPA hopes to avoid this concern. EPA believes that in locations where reformulated gasoline is found necessary to reduce the formation of ozone, a NO<INF>X standard is appropriate as well, as discussed below and in Section VI of the RIA. The Agency received many comments about the proposed NO<INF>X standards. Some commenters claimed it was counter to the regulatory negotiation agreement. This concern has been addressed in section A above. Others felt that NO<INF>X control should be considered on a local basis to meet local needs and thus should not be part of a national fuel program. Another stated that states should have to demonstrate the need for mobile source NO<INF>X control before EPA required it. Some commenters supported NO<INF>X control based on the cost-effectiveness analysis presented in the proposal because of the similarity with the costs of other current NO<INF>X control programs. One comment suggested that EPA control NO<INF>X by eliminating the oxygen requirement using the authority granted in section 211(k)(2)(A). It was also questioned whether EPA had satisfied the requirements to use the authority granted in section 211(c) regarding the supporting information presented in the proposal. The remainder of this section presents EPA's response to these concerns; additional detail may be found in the RIA.

a. Scientific justification for NO<INF>X control. As discussed in the RIA, a recent study by the National Research Council (NRC) indicated that VOC control alone is of minimal benefit to ozone nonattainment areas such as Houston which have high VOC to NO<INF>X ratios in the ambient air.<SUP>29 The NRC study and work by EPA<SUP>30 and others<SUP>31 have also indicated that NO<INF>X control is an effective ozone control strategy for the northeast

(including New YorkConnecticut and Boston-Maine) as well as the Lake Michigan region (Milwaukee, Chicago, and Muskegon). In general, many studies have shown that NO<INF>X control alone may be helpful in achieving ozone reductions in some areas, though not necessarily in all areas, again depending on the VOC to NO<INF>X ratios. Reductions in emissions of both VOC and NO<INF>X should benefit all areas, however. Those areas that do not benefit from the reduction in NO<INF>X emissions should benefit from the large reduction in VOC emissions that will be achieved by Phase II RFG.

\2\9National Research Council, Rethinking the Ozone Problem in Urban and Regional Air Pollution, National Academy Press, Washington, D.C., 1991.

\3\0U.S. EPA, Regional Ozone Modelling for Northeast Transport (ROMNET), EPA Report 450/4-91-002a, June 1991. \3\1See the RIA for additional references.

There are also non-ozone benefits of NO<INF>X control, such as reductions in emissions leading to acid rain formation, reductions in toxic nitrated polycyclic aromatic compounds, lower secondary airborne particulate (i.e. ammonium nitrate) formation, reduced nitrate deposition from rain, improved visibility, and lower levels of nitrogen dioxide. A complete discussion of these benefits can be found in the RIA. A NO<INF>X standard also should effectively protect against an increase in the olefin content of the fuel, reducing concern over a possible increase in the reactivity of vehicle emissions. b. Consideration of section 202 motor vehicle controls. Before controlling or prohibiting a fuel or fuel additive under section 211(c)(1)(A), the Administrator must consider ``other technologically or economically feasible means of achieving emission standards under section [202]." This has been interpreted as requiring consideration of regulation through motor vehicle standards under section 202 prior to regulation of fuels or fuel additives under section 211(c)(1)(A) [Ethyl Corp. v. Environmental

Prot. Agcy., 541 F.2d 1, 32 (D.C. Cir. 1976)]. This does not establish a mandatory preference for vehicle controls over fuel controls, but instead calls for the good faith consideration of motor vehicle standards before imposition of fuel controls [541 F.2d at 32 n.66]. This reflects Congress' recognition that fuel controls under section 211(c)(1)(A) might logically involve controls on fuel composition itself, while vehicle standards under section 202 are generally performance standards, regulating vehicle emissions and not the design or structure of the vehicle. Fuel controls might therefore lead to greater government involvement in the regulation of the manufacturing process than would be expected from vehicle controls [541 F.2d at 11 n.13]. Congress addressed this concern by requiring agency ``consideration" of vehicle standards under section 202 before imposition of fuel controls under section 211(c)(1)(A). It is important to note that the Administrator must in good faith consider such vehicle controls, but retains full discretion in deciding whether to adopt either fuel or vehicle controls, or both [541 F.2d at 32 n.66]. In evaluating motor vehicle controls under section 202 in this context, the first major point to consider is that EPA has already imposed more stringent NO<INF>X control standards on motor vehicles. The Tier 1 standards for light-duty motor vehicles and trucks require reductions in light-duty motor vehicle NO<INF>X emissions starting with model year 1994, with a percentage phase-in of the more stringent Tier 1 standards until they apply to all new model year 1996 and later light-duty vehicles and trucks. These vehicles are also required to meet in-use standards.<SUP>32 For heavy-duty vehicles, EPA recently reduced the NO<INF>X standard to 4 g/bhp-hr, starting with model year 1998 [58 FR 15781, March 24, 1993]

\3\256 FR 25724, June 5, 1991. Also, note that the Tier 1 standards apply to light-duty trucks with a loaded vehicle weight rating of 3,750 lbs. or less.

While these motor vehicle and motor vehicle engine controls are expected to reduce mobile

source emissions of NO<INF>X, this result is limited by certain basic facts. First, the standards only apply to new motor vehicles and engines. It will therefore take several years after the first model year of the standards before vehicles and engines certified to these standards will make up a significant portion of the motor vehicle fleet.<SUP>33 In addition, it is expected that emissions reductions based on the reduction in the NO<INF>X standard will be offset to a significant extent by an increase, over time, in total vehicle miles travelled.

\3\3As supported by the MOBILE5a model, 58 FR 29409, May 20, 1993.

In addition to motor vehicle controls under section 202, EPA has recently adopted or proposed other controls aimed at in-use NO<INF>X emissions from mobile sources. The enhanced inspection and maintenance (I/M) rules call for use of these more stringent I/M procedures starting with 1996 [57 FR 52950, November 5, 1992]. EPA has also proposed standards that would limit NO<INF>X emissions from new large horsepower diesel non-road engines, pursuant to section 213 of the Act [58 FR 28809, May 17, 1993]. While enhanced I/M programs will directly affect the motor vehicle fleet, the non-road engine regulations are similar to the motor vehicle regulations under section 202 in that they would apply to new non-road engines only, and therefore involve a certain time before a significant portion of this category of non-road engines is replaced by new engines certified to meet the NO<INF>X standards.

Additional mobile source controls, whether under section 202 or under other authority such as described above, may well be cost effective and reasonable options that EPA might decide to adopt. However, there are certain limitations imposed by Congress on adoption of more stringent standards (``Tier 2 standards''). For example, Congress spelled out when and under what conditions EPA may promulgate more stringent NO<INF>X standards for light-duty vehicles and trucks. Congress required that EPA conduct a study on whether more stringent standards for

light-duty vehicles and trucks should be adopted, and report back to Congress no later than June 1, 1997 [section 202(i) (1), (2)]. Based on the study EPA must conduct a rulemaking to determine whether there is a need for such further reductions, whether the technology will be available for such reductions, and whether further reductions in emissions from such vehicles will be cost effective. If these determinations are made in the affirmative, then EPA would proceed to promulgate emissions standards that are more stringent than the Tier 1 standards [section 202(i)(3)(C)]. If EPA does promulgate more stringent standards, they may not take effect any earlier than model year 2004, and no later than model year 2006. It is clear from this that EPA has not, at this time, completed the lengthy process for determining whether or not more stringent standards should be established for light-duty vehicles and trucks under section 202(i). Congress established a detailed provision spelling out the procedures to follow and the substantive determinations that must be made before such controls could be adopted. There is no indication, and EPA does not believe, that these mandated procedures and criteria preclude the exercise of discretion under section 211(c)(1)(A) prior to completion of the rulemaking under section 202(i). Congress required that EPA consider motor vehicle controls, but did not establish a mandatory preference for such controls and did not preclude the adoption of fuel controls prior to a decision on Tier 2 motor vehicle standards.

In any case, it is clear that a decision to impose more stringent NO<INF>X standards for light-duty vehicles and trucks under section 202(i) could not take effect prior to model year 2004. It would then take several years before a significant portion of the in-use fleet would include vehicles or trucks certified to a NO<INF>X standard more stringent than the Tier 1 standard. A similar situation would apply to a more stringent NO<INF>X standard for heavy-duty engines. The mandatory leadtime and stability provision of section 202(a)(3)(C)

would preclude imposition of more stringent NO<INF>X standards for heavy-duty engines until model year 2001 at the earliest. It would again take several years before a significant portion of the in-use heavy-duty fleet contained engines certified to a more stringent NO<INF>X standard. For non-road engines and vehicles, EPA expects to continue to explore NO<INF>X controls. But as with motor vehicles, any new or more stringent NO<INF>X standards will only apply to new nonroad engines, after providing a reasonable period for leadtime. The effect on in-use emissions is delayed based on the time needed before new non-road engines replace earlier models. Given these circumstances, there are several important reasons why promulgation of a NO<INF>X reduction standard for reformulated gasoline is important, whether or not additional vehicle or engine controls are later adopted by the Agency. First, emissions reductions from the NO<INF>X performance standard would start as soon as the standard is applicable, with no delay based on fleet turnover time. Significant NO<INF>X emission reductions would be achieved right away, in the summer of 2000, while more stringent light-duty or heavy-duty standards would not be expected to significantly affect in-use emissions until much later in that decade. Second, a NO<INF>X reduction standard for reformulated gasoline would act to reduce emissions from all mobile sources that use gasoline, whether on-road or off-road, while section 202 or section 213 standards only act to limit emissions from new engines or vehicles in that specific category of mobile sources. Third, this fuel control is specifically aimed at areas of the country that are in nonattainment for ozone, and is limited in time to that part of the year when ozone is of most concern. Vehicle or engine controls, in contrast, apply to all new engines or vehicles, wherever they are used, throughout the year. This fuel control thus allows a more narrow regulatory solution aimed at the specific geographical areas and time periods when control is needed. Fourth, the expected increase in vehicle miles travelled over time leads EPA to

believe that this fuel control is needed to continue to achieve the in-use NO<INF>X emission reductions necessary for many areas of the country to reach attainment for ozone. Finally, the NO<INF>X fuel standard adopted here minimizes any concern there might be that a fuel control would tend to interfere in the production process by directing refiners on how to make their product. The NO<INF>X standard is not a fuel recipe, but instead establishes a performance standard, leaving refiners free to produce their gasoline in any way that achieves the desired reductions. EPA is not at this time determining whether additional vehicle or engine NO<INF>X controls should be adopted under section 202 or any other provision of the Act. Instead, based on all of the above, EPA believes that a NO<INF>X reduction standard for reformulated gasoline under section 211(c)(1)(A) is an appropriate exercise of discretion, whether or not the agency imposes additional vehicle or engine NO<INF>X controls in the future.

c. Cost-effectiveness of NO<INF>X control in RFG. EPA has evaluated the cost-effectiveness of NO<INF>X control using the same costs that were used in establishing the standard for VOC control. The results are summarized in Table VI-2 below. The table indicates that sulfur is the only fuel parameter that results in significant NO<INF>X reductions at a reasonable cost. Changes in fuel parameters other than sulfur have only a small effect on NO<INF>X emissions at significantly higher costs, with the possible exception of olefin control (which would increase VOC at the same time it reduced NO<INF>X). A NO<INF>X reduction of approximately 6.8% could be achieved with sulfur control down to approximately 138 ppm at a reasonable cost, whether compared on the basis of the cost of the last increment of reduction (5.8% to 6.8% NO<INF>X) or the overall cost incremental to Phase I RFG reductions.

Table VI-2 --Fuel Parameter Control Costs and NO<INF>X Reductions\1\

Fuel parameter	Incremental cost (	Cumulative	Incremental	Incremental	control	cents/gal)

reduction cost-eff. to phase I

	(percent)	($/ton)	($/ton)\2\	
Phase I:				
RVP: 8.0 psi,				
Oxygen: 2.1wt				
percent,				
Benzene: 0.95				
percent.....				RVP to
6.7 psi...	0.4			
Sulfur to 250 ppm	0.12	2.4	1,300	3,200
Sulfur to 160 ppm	0.56	5.8	3,700	3,500
Sulfur to 138 ppm	0.24	6.8	5,200	3,700
Sulfur to 100 ppm	0.52	8.7	6,200	4,200
Olefins to 8.0				
vol percent.....	0.78	10.8	8,000	5,000
Aromatics to 20				
vol percent.....	2.01	11.9	40,000	8,200
Oxygen to 2.7 vol				
percent.....	0.61	12.5	25,000	8,900
Olefins to 5.0				
vol percent.....	2.77	14.1	37,000	12,000
E300 to 88				
percent.....	0.35	14.1	(-)	13,000
E300 to 91				
percent.....	2.01	14.2	820,000	16,000
E200 to 44				
percent.....	0.38	13.9	(-)	17,000

E200 to 47				
percent.....	1.32	13.7	(-)	19,000
E200 to 50				
percent	2.97	13.5	(-)	24,000 \1\Based on costs and emissions

reductions for VOC control region 2 (northern areas). Assumes all costs allocated to NO<INF>X control. Cost effectiveness values will be slightly lower if credit given for the VOC reductions that also result with some of the fuel changes. \2\NO<INF>X cost effectiveness incremental to a Phase II VOC standard would be slightly lower, especially for the first few increments.

A NO<INF>X emissions reduction of 6.8% would be slightly less than half of that achieved from California Phase II reformulated gasoline, since California requires sulfur reduction to approximately 30 ppm,<SUP>34 aromatics reduction to 22 vol%, olefins reduction to 4 vol%, and control of fuel distillation parameters.<SUP>35 However, the cost-effectiveness of producing a fuel with the requirements of California Phase II RFG in a national program would be extremely poor (roughly an order of magnitude higher) relative to that of the standards being set today.

\3\4All values based on the averaging standard. \3\5Based on the same methodology used to determine the 7.0% NO<INF>X reduction for federal RFG (using the complex model), California Phase II RFG is estimated to achieve a NO<INF>X reduction of about 14.6%.

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d. Cost-effectiveness of other NO<INF>X control strategies. The cost-effectiveness of a 6.8% NO<INF>X standard has been compared to the cost-effectiveness of other existing and planned mobile and stationary source NO<INF>X control programs. The Tier 1 emissions standards for light duty vehicles (already implemented for the 1994 model year) described above in 2.b will incur an estimated incremental cost of $2,000-6,000/ton NO<INF>X if credit is only given for

those emission reductions achieved in ozone nonattainment areas (to allow direct comparison with reformulated gasoline). Increasing the stringency of the NO<INF>X cutpoint in enhanced inspection and maintenance programs (in effect, causing a greater number of vehicles to fail the test and incur repair costs) is estimated to have a cost-effectiveness of $4,000-8,000/ton. Achieving the Tier 2 mobile source NO<INF>X standards (should EPA determine that such standards are necessary to meet air quality requirements) are likely to cost more than $10,000/ton of NO<INF>X reduced.

Certain NO<INF>X controls for heavy-duty highway and nonroad vehicles are likely to be as or more cost effective as a 6.8% NO<INF>X reduction standard. EPA is in the process of developing and studying such controls. However, as discussed in subsection 2.b, heavy-duty NO<INF>X controls cannot be implemented without mandatory leadtime provisions, and thus the benefits of these controls will not be realized for many years beyond implementation of the Phase II RFG standards. In addition, all heavy-duty mobile source NO<INF>X control strategies that have not yet been implemented or are not already under consideration are likely to be very costly. NO<INF>X control combined with the reformulated gasoline program is very reasonable by contrast. The comparative cost-effectiveness to stationary source NO<INF>X emission controls is based on control strategies suggested for utility boilers.<SUP>36 In ozone nonattainment areas, standards are being considered that will require controls more stringent than suggested by reasonably achievable control technology (RACT) standards. The RACT standards will likely be met through the use of low NO<INF>X burner technology. This technology has a relatively low cost-effectiveness at up to $1,000/ton, but the achievable emissions reduction is limited. In order to attain the required level of control for utilities to meet the ozone air quality standard in many areas, additional controls will likely be required,

especially by the year 2000. One of the likely strategies utilized will be selective catalytic reduction (SCR) which is estimated to cost $3,000-$10,000/ton NO<INF>X

\3\6``Evaluation and Costing of NO<INF>X Controls for Existing Utility Boilers in the NESCAUM Region"; Draft Report prepared by Acurex Corp., prepared for Bill Neuffer, OAQPS, U.S. EPA, October 1992.

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3. Final VOC Standards and NO<INF>X Standards To reduce the cost to the industry of complying with the Phase I and Phase II RFG standards, EPA had proposed granting refiners the option of meeting the VOC and the air toxics emission standards on an averaging basis rather than requiring compliance on a per gallon basis. However, the NO<INF>X emissions standards had to be met on a per gallon basis rather than on an average basis. Several comments received on the NO<INF>X standard expressed a desire for the allowance of NO<INF>X averaging as well as a per gallon standard. According to these comments NO<INF>X averaging would provide greater flexibility to refiners, and was consistent with the Reg-Neg agreement. One comment stated that NO<INF>X averaging would not cause air quality concerns, while a per gallon NO<INF>X standard (even at no NO<INF>X increase) would impose substantial constraints on VOC. NO<INF>X averaging would provide the industry with greater flexibility in meeting the NO<INF>X standard for Phase II RFG. In addition, the cost-effectiveness analysis is inherently based on averaging (since the costs are derived based on regional refinery models). Hence, EPA has elected to allow both a per gallon and an averaging standard for NO<INF>X emissions under the Phase II RFG program. As discussed in section VII, the Phase II averaging standard for NO<INF>X is set 1.3 percentage points more stringent than the per gallon standard (slightly smaller than the increment for VOC and air toxics). A minimum per gallon standard (under averaging) will be set at 4 percentage points below the averaging

standard, following the precedent set with the VOC standard for Phase I RFG. Based on all of the factors discussed above, as well as the results of the regulatory impact analysis, EPA today is setting VOC reduction standards for Phase II reformulated gasoline and concurrent NO<INF>X reduction standards for gasoline sold in areas participating in the RFG program beginning in the year 2000. (The toxics standard is discussed below in subsection 4.) The standards are shown in Table VI-3 below. The combination of fuel parameters on which the standards are based is just one of many fuel formulations which could be used to achieve the standards. From EPA's analysis of cost-effectiveness, however, it is clear that RVP control and sulfur control are expected to be the basic fuel parameter changes that refiners will rely on to comply with these standards. At the same time, it must be stressed that today's standards are performance standards which may be met by the refiner's choice of fuel parameter controls; EPA is not establishing specifications for fuel composition. Specific issues concerning these final standards are discussed in the following sections.

Table VI-3.--VOC Standards for Phase II Reformulated Gasoline and NO<INF>X

Reduction Standards

[Percent Reduction in Emissions]

Controlled emission	VOC control region 1	VOC control region 2
VOC:		
Per gallon..... \1\27.5	25.9	Averaging..... 29.0 27.4
Minimum.....	25.0	23.4
NO<INF>X:		
Per gallon.....	5.5	5.5
Averaging.....	6.8	6.8
Minimum	3.0	3.0 \1\Reductions relative to a base fuel

with RVP at 7.8 psi on a per gallon basis would be 17.2% for VOC and 5.3% for NO<INF>X.

a. Flexibility for refiners. The VOC and NO<INF>X standards presented in Table VI-3 were determined assuming both controls were necessary. Were EPA not to set a NO<INF>X standard, there may be greater flexibility to further control RVP for the purposes of VOC control. As shown in Table VI-1, for the purposes of VOC control RVP to 6.5 and sulfur to 250 ppm would achieve a reduction of 27.2% in VOC control region 2, at an incremental cost-effectiveness of $3,700/ton VOC (or less than $600/ton incremental to the Phase I reductions). This is nearly the same level of reduction achieved with RVP at 6.7 psi and sulfur reductions to 138 ppm under the combined VOC and NO<INF>X standards.

Various comments questioned basing the VOC standard on a gasoline RVP of 6.5 psi, due to potential driveability problems with fuels at lower RVPs (which refiners will produce on occasion to meet the average standard). Commenters were concerned that the VOC standard would reduce the flexibility available to refiners by essentially requiring all RFG to have an RVP of 6.5 psi. As discussed previously, EPA currently believes that 6.5 psi RVP is a practical limit in the reduction of gasoline volatility, due to the lack of information at the present time to ascertain whether or not driveability problems exist below that level. In the absence of NO<INF>X control, EPA believes that adequate flexibility would still exist for refiners to meet a VOC performance standard based on the control of RVP down to 6.5 psi, since some flexibility still exists in adjusting sulfur and olefin levels. However, in the context of a NO<INF>X standard this flexibility is greatly reduced.

A fuel meeting the combined requirements of 6.5 psi RVP and 138 ppm sulfur would achieve a VOC reduction of 28.4% (in VOC control region 2) and a NO<INF>X reduction of 6.9%.

Standards based on this fuel formulation could severely restrict the flexibility for some refiners, and pose an undue burden on others. For example, refiners with various parameter levels above the statutory baseline would need additional VOC control to offset the VOC impact of these parameters. Under the above scenario, these refiners would be limited in achieving further RVP control, since the ability to further reduce RVP and sulfur and/or increase olefins would be limited. This would significantly increase the cost-effectiveness of the VOC control. Upon consideration of these concerns, among other issues, EPA decided to set a VOC standard derived based on a fuel RVP of 6.7 psi to allow refiners some flexibility to meet the performance-based VOC standard through control of RVP without the need to go below 6.5 psi. By setting a concurrent NO<INF>X standard based largely on additional sulfur control, which also achieves some small additional VOC reductions, refiners will not need to go as low as 6.5 psi to meet the equivalent level of VOC control. The cost-effectiveness of a 6.8% (on average) NO<INF>X reduction standard when credit is given for the additional level of VOC control obtained at this level of sulfur reduction is approximately $5,000/ton NO<INF>X reduced. b. Costs and emissions reductions. The overall cost of the Phase II reformulated gasoline VOC standards and NO<INF>X standards for Phase II RFG is approximately 1.2 cents per gallon (incremental to Phase I RFG). This value appears to be reasonable, as the less stringent Phase I reformulated gasoline cost is estimated to be about 3-5 cents per gallon, as discussed in section V. EPA does not expect non-production related costs, such as distribution costs, recordkeeping and reporting costs, etc., to increase relative to Phase I reformulated gasoline. A complete discussion of the development of these costs is found in the RIA.

As a result of today's standards, VOC emissions will be reduced by about 10,000 tons in VOC control region 1 (southern) areas each summer and 32,000 tons in VOC control region 2

(northern) areas. In addition, southern areas will experience a reduction of about 8,300 tons NO<INF>X and northern areas will experience a reduction of 13,800 tons NO<INF>X. The emissions reductions experienced in southern areas are smaller than experienced in northern areas due to the fact that southern areas are already required to use fuels with lower Reid vapor pressures, and thus the emissions reduction benefits of RFG use in these areas is smaller. c. Compliance margin consideration. Several commenters expressed a desire for looser standards to account for compliance margins. The optional provision for averaging standards allows refiners to meet the standards in the manner which is most cost-effective for their refinery in exchange for meeting a standard that is considered at least or more stringent as the per gallon standard plus a compliance margin. The VOC and NO<INF>X reduction standards have both been based in part on a cost-effectiveness analysis that implicitly is based on an averaging standard. In that case, a compliance margin becomes much less relevant, if at all, because of the flexibility introduced through averaging. d. Local selection of VOC or VOC and NO<INF>X control. EPA requested comments on an option to allow nonattainment areas to select between either VOC control or combined VOC and NO<INF>X control, depending on the air quality needs of that area. A potential problem with this option is that it would require production of another type of reformulated gasoline in one or more grades. Distribution problems and complications already expected with implementation of the reformulated gasoline requirements could increase.

Many commenters opposed this option, citing added costs and complications to the distribution system which would likely result. No commenters appeared to be strongly in favor of it. Hence, the Agency has chosen not to allow local selection of a VOC and/or NO<INF>X control program. The standards for VOC and NO<INF>X emissions will apply to all reformulated gasoline areas. e. Other options considered. EPA proposed<SUP>37 and

investigated several options for VOC standards. One proposed option was to set a VOC standard at the statutory level of 25% reduction; this standard could also be set higher based on the cost-effectiveness analysis. Also mentioned in the NPRM was the option to relax the VOC standard if a NO<INF>X standard was promulgated to allow refiners more flexibility in meeting both standards. Finally, EPA proposed granting refiners the option to trade off VOC and NO<INF>X control within fixed limits on either standard.

\3\7As corrected in 58 FR 17175, Thursday, April 1, 1993

EPA determined that setting only a 25% reduction VOC standard (with a requirement of no NO<INF>X increase) would provide minimal NO<INF>X reductions and marginal VOC benefits to southern (VOC Control Region 1) areas which will already use lower RVP fuel than northern areas under Phase I. A higher VOC standard selected based on a cost-effectiveness benchmark of about $5,000/ton would get somewhat greater NO<INF>X reductions and some additional VOC reductions in southern areas. EPA has set the VOC standard based on a level of reduction that would allow flexibility to refiners and would not be too economically burdensome. Since a NO<INF>X standard is being set concurrently, EPA set the VOC standard based on a slightly more relaxed RVP than might have been used if only a VOC standard were implemented, as discussed above in subsection a. One comment on the proposal strongly opposed lessening the maximum achievable level of VOC reduction to achieve NO<INF>X reductions. As discussed above, however, roughly the same level of VOC reduction is being achieved with both a NO<INF>X standard and a VOC standard (basing the standard on a fuel with 138 ppm sulfur and an RVP of 6.7 psi) as would be achieved if only VOC control were required (basing the standard on a fuel RVP of 6.5 psi and a sulfur level of 250 ppm).

The final option proposed by EPA was to set a combined VOC and NO<INF>X standard and

allow refiners flexibility in controlling emissions of either. As discussed in subsection C.2 above, EPA believes it is important to achieve both VOC and NO<INF>X control. VOC control alone would not provide significant ozone reduction benefits in all areas using RFG. The option of allowing refiners to meet a combined VOC and NO<INF>X standard would have likely resulted in VOC control (primarily through RVP reductions) with minimal NO<INF>X control. Refiners would have had a strong incentive to augment the complex model through vehicle testing and push RVP well below the 6.5 psi level in order to avoid sulfur control (for NO<INF>X reductions), since RVP control is much less costly. As mentioned previously, EPA has significant concerns about driveability problems with fuels with RVPs lower than 6.5 psi. Since refiners would be limited in their ability to cost effectively achieve the combined standards, the reductions achieved through this type of program would be in question. Hence, EPA has decided not to implement a combined VOC and NO<INF>X standard. No significant comments were received on this option. 4. Toxics Standard

The statute sets the minimum Phase II standard for toxics reduction at 25%, although EPA has the authority to reduce this to no lower than 20% ``based on technological feasibility, considering cost."<SUP>38 EPA proposed both levels of reductions as options for the toxics standard. EPA has looked at the technology required to attain a 25% toxics standard, and the cost of implementing that technology. EPA expects that the technology implemented by refiners to comply with the required VOC and NO<INF>X reductions will result on average in a 26% reduction in annual toxics at reasonable costs, as discussed earlier. For certain refiners with higher baseline levels of various parameters, however, EPA expects that compliance with the VOC and NO<INF>X standards will not automatically lead to compliance with a 25% toxics standard. For these refiners, additional toxics control will typically require further benzene

reduction or aromatics reduction (if octane can be maintained). Benzene reductions would impact only emissions of benzene, not 1,3-butadiene, which has been shown to be of greater cancer-causing risk to the public than the other air toxics.<SUP>39 (The statutory requirements of section 211(k) requires a focus on reductions in mass emissions of air toxics, not on a reduction in cancer risk, and therefore does not permit EPA to set the standard based on cancer risk.) Implementation of the benzene and/or aromatics reduction technology will be expensive and will raise their costs of production, putting refiners facing this situation at a competitive disadvantage to those refiners who comply with the toxics standard ``for free" based on their compliance with the VOC and NO<INF>X standards. In addition, a requirement of additional toxics reductions may also limit refiners' flexibility in producing reformulated gasoline.

\3\8The toxics standard is a requirement for an average percent reduction over the entire year, not solely in the summer (high ozone) season.

\3\9``Motor-Vehicle Related Air Toxics Study," EPA Report 420- R-93-005, April 1993.

EPA has considered two additional factors in considering the feasibility of requiring this subset of refiners to pay the costs of implementing additional toxics control technology in order to meet a 25% standard. First, even if the toxics standard is reduced to 20%, EPA believes that the average toxics reduction across all refiners will still be above 25% based upon the fuel changes used to comply with the VOC and NO<INF>X standards. Second, the additional toxics control required by this subset of refiners results in very high cost per cancer incidence avoided. The main control strategies for toxics, benzene and aromatics reductions, are very expensive, in excess of $100 million/CI. This is well beyond the $1-10 million/CI which the Agency believes to be achievable through other programs. Even though a 25% toxics standard is technologically feasible, the unique circumstances discussed above raise questions about the increased cost to

this subset of refiners of implementing additional toxics reduction technology. Based on these concerns regarding the costs of implementing toxics control technology, EPA is setting the toxics standard for Phase II RFG in both VOC control regions at 20%. There was general support in the comments received for the fact that the cost-effectiveness of toxics control beyond a 20% reduction is questionable. No substantive comments were received opposing the option of setting the standard at the minimum 20% reduction.

Based on today's standards and the analysis summarized in the RIA, about 630 tons of toxics will be reduced in VOC control region 2 each summer and 370 tons of toxics in VOC control region 1. Emissions of all toxics except formaldehyde will be reduced. As a result of these emissions reductions, approximately 3-4 cancer incidences will be avoided annually nationwide (incremental to Phase I).

VII. Enforcement

Section 211(k) of the Clean Air Act requires, beginning January 1, 1995, that the gasoline sold or dispensed in certain ozone nonattainment areas must be certified as reformulated. Gasoline that is not certified as reformulated is classified as conventional gasoline and must be sold outside these nonattainment areas. Under the enforcement scheme promulgated today, refiners and importers will be required to designate all gasoline as either reformulated or conventional. Gasoline designated as reformulated must meet the standards for reformulated gasoline, and conventional gasoline must meet the anti-dumping standards for conventional gasoline. In addition, refiners and importers will be required to prepare product transfer documents for all gasoline produced or imported, that identify the gasoline as reformulated or conventional and specify restrictions as to the time and place where the gasoline may be used. Parties downstream of refiners and importers that transport, store, or dispense gasoline are responsible

for ensuring that only reformulated gasoline is used in reformulated gasoline covered areas, and that reformulated gasoline is used at a time and place consistent with the time and place of use restrictions recited in the product transfer documents. In addition, downstream parties are responsible for ensuring that reformulated gasoline does not violate the per-gallon minimum and maximum standards, discussed more fully below. During calendar years 1995 through 1997, refiners and importers may certify reformulated gasoline pursuant to either the Phase I simple model standards, or the Phase I complex model (early use) standards. This election must be made separately for each refinery on a calendar year basis. During calendar years 1998 and 1999, all reformulated gasoline must meet the Phase I complex model standards, and beginning in 2000, all reformulated gasoline must meet the Phase II complex model standards.

The final rule establishes reformulated gasoline standards for oxygen, benzene, toxics emissions performance, and heavy metals under all models. Standards for RVP, sulfur, T-90, and olefins are included only under the simple model, and standards for VOC and NO<INF>X emissions performance are included only under the Phase I and II complex models.

A refiner or importer electing early use of the complex model during 1995, 1996, or 1997 must determine individual refinery or importer performance standards for VOC, toxics, and NO<INF>X. These standards are determined by evaluating the following slate of fuel parameter values in the Phase I complex model: The simple model requirements, per section 80.41(a) or (b), for benzene, RVP and oxygen; the aromatics value necessary to meet the simple model toxics standard using these values for benzene, RVP and oxygen; the refinery or importer individual baseline values for E-300, sulfur, and olefins; and the statutory summertime or wintertime baseline value for E-200. The percent reductions in VOC, toxics, and NO<INF>X emissions determined using the above fuel in the Phase I complex model are the reformulated

gasoline standards for a refinery or importer electing early use of the complex model.

Beginning in 1998, the Phase I reformulated gasoline VOC, toxics, and NO<INF>X standards for a refinery or importer are as specified in section 80.41 (c) and (d). As a result of the individual refinery or importer baselines under complex model early use, gasoline that is produced under this option at any specific refinery or imported by any specific importer, may not be fungibly mixed with gasoline that is produced at another refinery or imported by another importer. This segregation of early use complex model gasolines, and other segregation requirements, are discussed more fully below. Refiners and importers may elect to meet certain reformulated gasoline standards either on a per-gallon basis or on average. This election, which must be made separately for each parameter and separately for each calendar year, applies to all gasoline produced at a refinery by a refiner, or imported by an importer, during a calendar year. Refiners and importers cannot meet the standard for any single parameter on a per-gallon basis for certain batches and on average for other batches during any calendar year. A refiner or importer that opts for compliance on average must also meet requirements for gasoline quality surveys. Standards that may be met on average are RVP, oxygen, and benzene, and VOC, toxics, and NO<INF>X emissions performance.

The purpose of the gasoline quality surveys is to ensure, for example, that RVP averaging by refiners or importers does not result in a covered area receiving reformulated gasoline that, on average over the covered area, has a higher RVP than would occur without such refiner or importer averaging. This applies for each parameter subject to refiner or importer averaging. In the event a gasoline quality survey reveals that the gasoline being used in a covered area does not meet the per-gallon standard for any regulated parameter, the pergallon maximum or minimum standard for that parameter is made more rigorous, and except in the case of oxygen

the standard for average compliance is made more rigorous. With certain limited exceptions, these adjusted standards apply to all gasoline produced at each refinery that supplied the covered area with the failed survey during the year of the survey failure, or during any year the adjusted standards apply. These gasoline quality survey requirements also apply to oxygenate blenders that meet the oxygen standard on average. The final rule also includes other mechanisms to ensure that refiner or importer averaging will not result in a covered area receiving reformulated gasoline that, on average, is less ``reformulated" than would occur absent such refiner or importer averaging. To meet this goal, EPA established standards for average compliance that are more rigorous than the standards for per-gallon compliance, and established the per-gallon maximums and minimums that apply to gasoline meeting the averaged standards. These maximums and minimums limit the range of averaging for the averaged standards, and the more stringent averaged standards require refiners and importers to further reformulate their gasoline to meet these standards. Refiners and importers may meet the averaged standards for oxygen and benzene through the exchange of credits. Credits are generated as a result of a refiner producing, or an importer importing, gasoline that on average exceeds the averaged standards for oxygen or benzene over the averaging period. An oxygenate blender using the averaged oxygen standard may generate, or use, oxygen credits. The final rule specifies the manner in which credits must be used. Credits must be generated in the same averaging period as they are used--credits may not be banked for use in a later averaging period; all credit transfers must occur within fifteen days following the end of the averaging period in which they are generated; and only validly created credits may be used to achieve compliance. The final rule constrains the use of the averaged standard for oxygen, and the use of oxygen credits in certain circumstances. Reformulated gasoline subject to simple model standards that is designated for

use in the high ozone season--VOC-controlled reformulated gasoline--must meet both the oxygen standard and the RVP standard separately during the VOC control period (discussed more fully below). Simple model VOC-controlled gasoline may not be averaged with simple model non-VOC-controlled gasoline to show compliance with the oxygen standard during the VOC control period. In addition, reformulated gasoline designated for use in cities subject to the requirements of the oxygenated fuels program during the oxygenated fuels program control period (or ``OPRG'' gasoline) may not be averaged together with gasoline not designated for this use for purposes of meeting the oxygen standard on average.<SUP>40 As a result, only oxygen credits generated from VOC-controlled gasoline subject to simple model standards may be used to meet the separate oxygen standard for VOCcontrolled gasoline; and oxygen credits generated from OPRG gasoline may only be used to meet the oxygen standard for OPRG gasoline. The mechanisms used to ensure correct accounting under these oxygen averaging and credit constraints are discussed in a separate section below.

\4\0The oxygenated fuels program refers to state programs established pursuant to Sec. 211(m) of the Act, involving wintertime use of oxygenated gasoline to control emissions of carbon monoxide.

The final rule also includes provisions that regulate the manner in which oxygenates may be added downstream of the refinery or import facility within the reformulated gasoline program. Oxygenate may only be added to specially formulated reformulated gasoline blendstock intended for such downstream oxygenate blending (or ``RBOB''). If oxygenate were added to reformulated gasoline not specially formulated, in most cases the resulting gasoline would not meet the reformulated gasoline standards. Refiners and importers of RBOB are required to include in the RBOB product transfer documents the type and amount, or range of types and

amounts, of oxygenate that may be blended with each particular RBOB. RBOB must be segregated from reformulated gasoline, and from other RBOB having different oxygenate requirements, to the point of oxygenate blending. Distributors may only dispense RBOB to registered oxygenate blenders. Oxygenate blenders may only blend the specified type and amount of oxygenate with any RBOB, and must meet the standard for oxygen for all RBOB dispensed to them. Refiners and importers are required to meet the reformulated gasoline standards for RBOB for all parameters other than oxygen, based on the properties of the reformulated gasoline that will be produced through blending the appropriate type and amount of oxygenate with the RBOB. As a result, if the incorrect type and/or amount of oxygenate is blended with the RBOB, the refiner or importer may fail to comply with the non-oxygen standards.

In order to ensure that the non-oxygen standards for RBOB are met, refiners and importers may transfer RBOB only to oxygenate blenders with whom they have a first- or second-hand contractual relationship. This contract must include procedures intended to ensure proper performance of oxygenate blending. In addition, the refiner or importer must conduct a quality assurance program over the oxygenate blender's blending operation.

These constraints on the transfer of RBOB do not apply if a refiner or importer designates the RBOB as suitable for blending with any oxygenate or with ethers only,<SUP>41 and assumes that ethanol will be blended with ``any-oxygenate" RBOB and MTBE will be blended with ``ether-only" RBOB. A refiner or importer using this blending assumption option further assumes that the volume of oxygenate blended will be that amount necessary for the resulting reformulated gasoline to have an oxygen content of 2.00 weight percent, or approximately 5.70 volume percent in the case of ethanol, and approximately 10.80 volume percent in the case of MTBE. These oxygenate blending assumptions are discussed more fully below.

\4\1The ethers include but are not limited to MTBE, TAME, and ETBE.

In order to ensure that gasoline produced or imported as reformulated in fact meets the reformulated gasoline standards, refiners and importers are required to engage an independent laboratory to sample each batch of reformulated gasoline produced or imported, and to analyze up to ten percent of the samples collected. EPA will direct the independent laboratories as to which samples to analyze. Refiners producing gasoline using computer-controlled in-line blending may obtain a waiver from EPA and have the in-line blending records audited in lieu of the independent sampling and testing requirements. The independent sampling and testing requirement is discussed more fully below.

Under the final rule, refiners, importers, and oxygenate blenders are required to keep specified records that relate to the production or importation of gasoline, sampling and testing of gasoline, credit transfers, and compliance calculations. All regulated parties are required to keep copies of product transfer documents, and records of any quality assurance sampling and testing performed. Refiners, importers, and oxygenate blenders are required to submit reports to EPA that contain information necessary to demonstrate that standards have been achieved either per-gallon or on average. The periods for reporting are calendar quarters (January through March, April through June, July through September and October through December). The quarterly reports are due on the last day of the second month following the end of the quarter. Quarterly reports consist of detailed information describing each batch of reformulated gasoline or RBOB produced or imported. Additional reporting requirements apply for refiners, importers, and oxygenate blenders who produce reformulated gasoline or RBOB which meets any of the applicable standards on average. RVP, VOC, and NO<INF>X averaging reports are submitted with the third quarterly report of a given year and cover the high ozone season averaging period.

Oxygen, benzene and toxics averaging reports and credit transaction reports are submitted with the fourth quarterly report and cover the annual averaging period. Credit transaction and averaging reports are not required for reformulated gasoline or RBOB which meets all of the applicable standards on a per-gallon basis.

Refiners, oxygenate blenders, and importers are required to register with EPA by November 1, 1994 or no later than three months in advance of the first date the party will produce or import reformulated gasoline, whichever is later. Registration information identifies the refiner, blender, or importer and any facilities at which reformulated gasoline or RBOB may be produced, and the independent laboratory that will be used to fulfill the independent analysis requirements. EPA will supply a registration number to each refiner, importer, and oxygenate blender, and a facility registration number for each refinery and oxygenate blending facility that is identified; these registration numbers must be used in all reports to EPA. The final rule includes a requirement that all refiners, importers, and oxygenate blenders must commission an annual review of the information contained in the reports to EPA, or an ``attest engagement.'' Attest engagements must be conducted either by a Certified Public Accountant, or by a Certified Internal Auditor, following procedures included in the final rule. The attest procedures are intended to ensure that all gasoline produced or imported is included in the reports for either reformulated gasoline or conventional gasoline; that product transfer documents are properly prepared; that the requirements for downstream oxygenate blending are met; and that in the case of a refiner using computer-controlled inline blending, that the blend records support the reported properties of the gasoline produced.

All parties in the gasoline distribution system are required to segregate certain categories of reformulated gasoline from other categories. These segregation requirements result primarily

from the time and place of use restrictions necessary for reformulated gasoline, and to a lesser extent are necessary for per-gallon minimums and maximums and gasoline quality surveys in covered areas. In summary form, the segregation requirements are the following. Gasoline subject to simple model standards may not be fungibly mixed with gasoline subject to complex model standards. In addition, gasoline produced at any refinery or imported by any importer that is subject to the complex model before 1998 must be segregated from complex model gasoline produced at any other refinery or imported by any other importer. These two segregation requirements, which are limited to the period 1995 through 1997, are necessary in order for per-gallon minimums and maximums and gasoline quality surveys to properly function.

Only gasoline that is VOC-controlled may be used during the high ozone season, which requires the segregation of VOC-controlled and nonVOC -controlled gasoline in advance of the high ozone season (other than to ``blend up" storage tanks to the VOC-controlled standards). Similarly, only gasoline designated for VOC Control Region 1 may be sold in that region, which requires the segregation of VOC Control Region 1 gasoline from VOC Control Region 2 gasoline. In addition, VOCcontrolled gasoline produced with ethanol may not be mixed with VOCcontrolled gasoline produced using any other oxygenate during the period January 1 through September 15. These segregation requirements are necessary in order for VOC emission reductions to be achieved. Lastly, only gasoline designated as oxygenated fuels program reformulated gasoline (OPRG) may be sold in an oxygenated fuels program area during the oxygenated fuels control period, which requires the segregation of OPRG gasoline from non-OPRG gasoline in advance of any oxygenated fuels control period (other than to ``blend up" storage tanks). This segregation requirement is necessary so that the extra oxygenate used in oxygenated fuels program cities does not, through averaging, result in non-oxygenate fuels

program cities receiving less oxygen than is required under the Clean Air Act. The final rule establishes liability for a number of prohibited activities that may occur downstream of the refinery or importer, including the following: The sale, dispensation, transportation, or storage of conventional gasoline represented to be reformulated; the failure of reformulated gasoline to meet the minimum or maximum standards; and the use of reformulated gasoline in a manner inconsistent with the time and place of use restrictions recited in the product transfer documents. When such a violation is found, the following parties are presumed liable: The operator of the facility at which the violating gasoline is found, and each upstream party, other than carriers, that supplied any of the gasoline found to be in violation. In the case of a facility operating under the brand name of a refiner, that refiner is also presumed liable regardless of whether the refiner supplied any of the gasoline found in violation. A party presumed liable may establish an affirmative defense by showing that it did not cause the violation, that the party's product transfer documents were proper, and that the party carried out a quality assurance program to monitor the per-gallon minimum and maximum standards of the gasoline under the party's control. A more detailed description of the liability and defense provisions relating to carriers is included below. The final rule specifies the manner in which penalties will be determined for violations of the final rule. These penalty provisions include calculations of the number of days of violation, and presumptions regarding the properties of gasoline. The remainder of Section V of the preamble discusses major changes from the enforcement provisions that were proposed in the supplemental notice of proposed rulemaking published at 58 FR 11722 (February 26, 1993). The following portion of this section also responds to a number of significant public comments on the enforcement provisions contained in the 1993 proposal. Responses to other significant comments EPA received are contained in a separate ``response to

comments" document that has been placed in the docket for this rulemaking.

A. California Enforcement Exemption

In the February 26, 1993, notice of proposed rulemaking (NPRM), EPA proposed to exempt refiners, importers and blenders of ``California gasoline" from certain enforcement provisions in the proposed federal reformulated gasoline regulations. The Agency generally proposed that ``California gasoline" would mean gasoline subject to the State of California's reformulated gasoline regulations that was either produced within the State or imported into the State from outside the United States.

The proposed California enforcement exemptions were based on the Agency's comparison of the estimated emission reduction benefits of California's Phase 2 reformulated gasoline program with those anticipated from the federal phase I reformulated gasoline program, using the federal complex model proposed in the NPRM. The California Phase 2 program establishes standards for eight gasoline characteristics--sulfur, benzene, olefin, aromatic hydrocarbons, oxygen, RVP, T50 and T90--applicable starting March 1, 1996. EPA's analysis indicated that California Phase 2 gasoline will have a greater emission reduction benefit than federal reformulated gasoline. This analysis also indicated that, in the case of VOC, toxic and NO<INF>X emissions performance, California Phase 2 gasoline has a greater emissions performance reduction than federal phase I gasoline, compared to Clean Air Act base gasoline. EPA's review also indicated that the California oxygen ``flat limit" of 1.8 to 2.2% will in practice be equivalent to the 2.0% minimum oxygen content required by the Act. See 58 FR 11746-7 (February 26, 1993).

The Agency proposed that, effective with the start of California's Phase 2 program, regulated parties would be exempt from meeting the enforcement requirements dealing with compliance surveys (section 80.69), independent sampling and testing (section 80.70(c)), designation of

gasoline (section 80.70(d)), marking of conventional gasoline (section 80.70(g)), downstream oxygenate blending (section 80.72), record keeping (section 80.74), reporting (section 80.75), product transfer documents (section 80.77), and antidumping record keeping (section 80.105) and reporting (section 80.106).<SUP>42 Between the January 1, 1995, start of the federal program and the March 1, 1996, start of the California Phase 2 program, EPA proposed a more limited set of exemptions from federal enforcement requirements, specifically the compliance survey and independent sampling and testing requirements (sections 80.69 and 80.70(c), respectively).

\4\2 The numbering of many provisions in the proposed regulations has been changed in the final rules. For example, proposed Sec. 80.69 is now Sec. 80.68, proposed Sec. 80.70(c) is now Sec. 80.65(f), proposed Sec. 80.70(d) is now Sec. 80.65(d), proposed Sec. 80.70(g) is now Sec. 80.65(g), and proposed Sec. 80.72 is now Sec. 80.69. Cross-references in the final California enforcement exemption regulation have been revised to reflect these and other numbering changes in the final reformulated gasoline regulations.

The Agency also proposed a number of restrictions on the applicability of the California enforcement exemptions. First, the exemptions would not apply to gasoline sold in California and produced at a refinery located within the United States but outside California. Similarly, the exemptions would not apply to gasoline produced in California but sold outside that State. Second, the exemptions would not apply to gasoline produced under a two-year (March 1, 1996, through February 29, 1996) extension granted to small refiners under the California regulations. Third, the exemptions would become null and void (i.e., they would not apply to any California regulated party) if any gasoline formulation certified by the State using a predictive model or vehicle testing does not comply with the federal reformulated gasoline standards. Fourth, the

enforcement exemptions would cease to apply to a party granted a variance by California unless EPA granted relief for extraordinary circumstances under section 80.73 of the federal regulations. Fifth, a regulated party that is assessed a penalty for a violation of either the California or federal reformulated gasoline requirements would lose its enforcement exemptions. (Such a party could petition the Agency for relief from this result, for good cause.) Sixth, the California enforcement exemptions would apply only during the time that the federal phase I program remains in effect (i.e., until the year 2000), subject to extension in a later rulemaking.

The February 26, 1993, NPRM contains a more detailed discussion of the California reformulated gasoline program, the Agency's comparison of the emission reduction benefits of the California and federal programs, and the proposed California enforcement exemption provisions. That notice also includes a detailed rationale for the proposed exemptions and restrictions. See 58 FR 11747-11750. The Agency received several comments on the proposed California enforcement exemptions, all of which were generally supportive of the regulation. Most of these comments also suggested various modifications and clarifications of the proposed regulations. In this final rule the Agency is promulgating a revised version of the California enforcement exemptions regulation, which includes many of the modifications recommended by commenters.<SUP>43 A detailed discussion of these comments, the Agency's responses to these comments, and the modifications made to the proposed rule is contained in a separate ``Responses to Comments'' document. The following is a summary of the more significant changes made to the proposed rule:

\4\3The Agency has re-analyzed the relative emission reduction benefits of the California Phase II reformulated gasoline program and the federal Phase I program, using the complex model being promulgated today, and has again concluded that the California program is at least

as stringent as the federal program. The analysis also found that fuel meeting the standards of the California Phase II program has a greater VOC, NO<INF>X and toxic performance reduction than fuel meeting the federal reformulated gasoline Phase I standards. A copy of this analysis has been placed in the rulemaking docket.

The proposed exclusion from the enforcement exemptions of small refiners who are granted a two-year extension under the California program has been dropped from the final rule. The Agency has determined that the emissions performance of fuels meeting the California reformulated gasoline standards to which these refiners will be subject during the two-year period, in conjunction with the statewide California sulfur standard, meets or exceeds the performance required under the Phase I federal reformulated gasoline program, as measured by the complex model (which may be used to determine compliance with federal standards during this period<SUP>44). An analysis of these standards has been placed in the rulemaking docket.

\4\4 Use of the complex model is optional until the end of 1997, and mandatory thereafter.

The enforcement exemptions have been extended to California reformulated gasoline produced at refineries located outside of California that produce only California reformulated gasoline and federal conventional gasoline (i.e., that do not produce federal reformulated gasoline). The primary rationale for excluding such gasoline, that its producer would be required to implement all of the federal enforcement provisions for a refinery's non-California reformulated gasoline, is not applicable to facilities that do not produce federal reformulated gasoline. In order to assure that such gasoline is in fact shipped to, and sold in, California, section 80.81(g) of the final regulations now prescribes transfer documentation and record keeping requirements for such gasoline. The compliance survey exemption is extended to all gasoline subject to the California reformulated gasoline regulations (no matter where produced)

and will not be lost by a party who otherwise loses its California enforcement exemptions (e.g., a refiner who violates federal or state reformulated gasoline regulations or whose gasoline formulation is found to be less stringent than the federal requirements). The purpose of compliance surveys is to ensure that each area receiving reformulated gasoline receives gasoline that, on average, achieves the performance that would be expected if per-gallon compliance was the only available compliance option. The Agency believes that there would be little purpose served in imposing this requirement on only a small subset of the gasoline sold in California. Exemptions from the following enforcement provisions have been added in the final rule: the parameter value reconciliation requirements in section 80.65(e)(2); the reformulated gasoline and RBOB compliance requirements in section 80.65(c); the annual compliance audit requirements in section 80.65(h); and the compliance attest engagement requirements in subpart F. The Agency believes that these exemptions are consistent with the rationale for the exemptions proposed in the NPRM.

The provision related to withdrawal of the enforcement exemptions on the basis of certification by California of a gasoline formulation that does not meet the federal reformulated gasoline standards has been modified in several ways. First and most importantly, the withdrawal will only apply to the refiner, importer or blender of the noncomplying formulation, not to all California gasoline. Second, any party whose gasoline is certified under either the predictive model or vehicle testing provisions of the California regulations will be required to notify the Agency within 30 days of such a certification and to submit a written demonstration that the gasoline formulation is in compliance with federal standards. If such a demonstration is not timely submitted, the exemptions are automatically (and immediately) lost. If a submitted demonstration is determined to be incorrect by the Agency, EPA will notify the party (by

first-class mail)<SUP>45 that its enforcement exemptions will expire on a certain date. Third, the date on which these exemptions will expire has been extended to no earlier than 90 days from the date of the EPA notice, to provide additional time for compliance. The Agency believes that this additional time is needed to comply with all of the many enforcement requirements that will become applicable if a California exemption is lost. In particular, requirements such as the independent analysis requirements (section 80.65(f)) and the compliance attest engagement requirements (subpart F) may require the negotiation of contracts with third parties.

\4\5 Because the loss of the enforcement exemption will apply to only a single party (rather than to all producers and importers of California gasoline), the Agency does not believe that there is a need for a Federal Register notice announcing a determination of non-compliance (as proposed in the NPRM) and has deleted this provision from the final rule.

The effective date for the withdrawal of the enforcement exemptions on the basis of a reformulated gasoline penalty assessment has been extended to 90 days, and this provision has been revised to make clear that this grace period does not begin until any interim administrative appeal has been completed. Once a final penalty assessment has been made by an agency or a district court, the 90-day period will begin. The provision related to compliance with standards on average for an averaging period that is partly before and partly after March 1, 1996, has been clarified. Under the final rule, producers and importers who elect to demonstrate compliance on average with any federal reformulated gasoline standard<SUP>46 will be required to demonstrate such compliance for two overlapping averaging periods: January 1, 1995, through December 31, 1995; and March 1, 1995, through February 29, 1996. The proposal could have been interpreted to require compliance with these standards for a two-month averaging period in early 1996, which would be very difficult for refiners to meet on average and which was not

intended by the Agency.

\4\6 In the case of refiners and importers using the simple model, the standards that may be met on average are the RVP, benzene, oxygen, and toxics emissions performance standards. For parties using the complex model, the standards that may be met on average are the benzene, oxygen, and toxics and VOC emissions performance standards.

The provision intended to prohibit the averaging of ``very clean" California reformulated gasoline with ``less clean" federal reformulated gasoline has been clarified in the final rule. In addition, it has been made applicable to producers and importers of all gasoline subject to the California program, not just to refiners and importers located outside the State (as was proposed). Section 80.81(d) now provides that producers and importers of such gasoline must exclude the volume and properties of California reformulated gasoline from all conventional gasoline and federal reformulated gasoline sold elsewhere, for purposes of demonstrating compliance with standards specified in section 80.41 and 80.90. An overall demonstration of compliance for all gasoline (California and non-California) produced or imported is also still required.

The exemption from the federal recordkeeping requirements has been modified to require the retention for five years of records mandated by section 2270 of the California reformulated gasoline regulations (which require retention for two years). This requirement, along with other enforcement provisions for which an exemption is not being provided, will provide the Agency with the capability of performing audits of compliance with federal requirements by parties who produce California reformulated gasoline.

As noted above, more detailed information on the modifications made to the proposed rule and the comments on which they are based is contained in the separate ``Responses to Comments" document. That document also responds to comments that did not result in changes

to the proposed rule.

B. Testing Methods and Testing Tolerances

The final rule, in section 80.46, sets forth test methods regarding reformulated gasoline parameters. EPA has carefully considered all comments concerning proposed test methods and related issues and many of those comments have been incorporated in the final rule. The test methods are those that provide for the best balance of accuracy, cost effectiveness and ease of use for competent lab technicians. The final rule generally provides for one regulatory method for each parameter in order to assure accuracy and to avoid problems with biases between different methods. However, in two cases (regarding oxygen and aromatics) the regulation provides for an alternative method for industry to use, if desired, until January 1, 1997, to provide lead time to acquire equipment necessary for the primary test method and to become familiar with its use. Where American Society of Testing and Materials (ASTM) methods have been adopted, any future updated version of the ASTM methods will not automatically be adopted. EPA will use appropriate procedures if it desires to adopt any updated methods.

1. Test Methodology Overview

EPA proposed test methods for the measurement of each of the parameters required in the creation of reformulated gasoline, and received numerous comments regarding the proposed methods. Most of the comments were quite similar in their overall character. However, one commenter seemed to summarize the prevailing recommendations quite well. API stated in part: ``API recommends that EPA observe the following guiding principles regarding laboratory test methods: (1) Test methods must be proven. . . . (2) Test methods must be reliable. . . . (3) Test procedures must be suitable for refinery personnel. . . . (4) Test methods must not be unnecessarily costly. . . . (5) Test method reproducibility must be recognized. . . . (6) Criteria for

adoption of other methods should be developed. . . ." EPA agrees with most of these criteria. It would be ideal to discover accurate test methods that have been proven reliable in the industry, that are easy for personnel to operate and have a minimal cost. The new test method for Reid Vapor Pressure (RVP) set forth in the volatility regulations (40 CFR part 80, appendix E, Method 3) is an example of such a method that is accurate, easy to operate and is relatively inexpensive. These qualities in the RVP test method have enabled many downstream parties to incorporate this method into their oversight program under the volatility rule. EPA believes this improved oversight contributed significantly to the reduction in volatility violations during the 1993 high ozone season. Ease of operation and cost were considered when EPA adopted this test method. However, it must be recognized that the most important factors in the choice of the new RVP test method were its accuracy and precision. EPA would like to prescribe test methods that conform to API's criteria. However, EPA's leading priority must remain precision and accuracy, even at the expense of other criteria. EPA is always willing to cooperate with industry to investigate the possibility of easier and less expensive methods if the methods also are accurate and precise. To do so not only aids industry, but also ultimately assists EPA's purpose of preventing violations.

EPA must follow its policy in maintaining precision and accuracy with regard to any enforcement test tolerances as well. EPA is determined to achieve the most accurate and precise result that is practical. EPA's purpose in testing is to ensure relevant standards are being met, and to allow an enforcement action where EPA is able to establish a violation with reasonable certainty. However, EPA does not have sufficient data at this time from the EPA laboratory to determine the most precise test tolerances. Interim test tolerances have been established until that data becomes available. Enforcement test tolerances are discussed more fully below. Most

commenters requested that EPA allow more than one test method for each parameter. The final rule provides for one regulatory method for each parameter in order to assure accuracy and to avoid problems of bias between different methods. Refiners and importers must use the regulatory method, or an alternative method in the case of two parameters during a limited time period, when testing to meet the mandatory testing requirements of section 80.65(e). In addition, independent laboratories, when conducting tests to verify the accuracy of the refiner and importer testing, must use the regulatory method. EPA has learned from its experience with other motor vehicle fuel regulatory programs, notably volatility, that it is preferable to have one regulatory testing method as opposed to multiple regulatory test methods for each parameter because of the potential for conflicting results among methods due to bias. However, in two cases, oxygen and aromatics, where the test methods are relatively new, the regulation provides for optional alternative methods for refiners and importers to use to meet the testing requirements of section 80.65(e) until January 1, 1997, providing lead-time for industry to acquire equipment and to become familiar with use of the regulatory methods. Of course, these alternative methods can likewise be used at any time for defense purposes as long as there is correlation with the regulatory methods.

2. Test Methods Under Section 80.46

a. Reid vapor pressure (RVP). EPA proposed to use the ASTM method ES-15 or the procedure described in 40 CFR part 80, appendices D and E. Comments favored the use of ASTM ES-15. However, it was noted that ES- 15 is a temporary emergency ASTM standard and will expire shortly. ASTM D-5191 is the permanent standard. It was also noted that this method is suitable for oxygenated blends.

Commenters requested that EPA also allow the two dry methods set forth in appendices D and

E in 40 CFR part 80. These methods are the manual tank and gauge method, the Herzog analog method, and the Herzog digital method. In addition, a request was made to include the ASTM D-5190 method, an alternative mini method. EPA has decided that RVP must be determined in accordance with the method in 40 CFR part 80, appendix E, Method 3. This method, very similar to ASTM D-5191, clearly complies with many of the criteria espoused by API. The method is simple and inexpensive. Industry has already begun to gear up for this method because of its use in the Phase II Volatility regulations. It is appropriate to use the same RVP test method for the volatility and reformulated gasoline programs to prevent confusion and inconsistencies. EPA has decided that the method in 40 CFR part 80, appendix E, Method 3 will be the only regulatory volatility test method. As with the volatility rule, other methods may be used for defense purposes as long as the method used is properly correlated with the regulatory method. (40 CFR part 80, appendix E, Method 3, Paragraph 9.4). See, 58 FR 14476 (March 17, 1993) for a more thorough discussion regarding the choice of a single volatility test method. b. Distillations. EPA proposed to use the ASTM method D-86-82 as the regulatory test method, and comments were favorable with regard to this method. It was noted, however, that the method was updated in November 1990. This most recent revision of this method is ASTM D-86-3. One commenter requested that the language be more specific. Another commenter suggested that a newer method, D-3710, which is a gas chromatography method, be used. A notation was also made that the repeatability and reproducibility figures in degrees Fahrenheit in the ASTM method D-86-90 were incorrect.

EPA has decided that the distillation parameters must be determined in accordance with the ASTM method D-86-90. The regulatory language has been amended to state that the figures for repeatability and reproducibility given in degrees Fahrenheit in Table 9 in the ASTM method are

incorrect, and may not be used. As with all the parameters, there will be only one regulatory distillation test method. However, other suitable methods may be used for defense purposes (but not to meet mandatory testing requirements) as long as they are properly correlated with the regulatory test method. EPA is always interested in the development of alternative methods if they are as accurate and precise as the regulatory test method. Many of the parameters in reformulated gasoline can be measured by a gas chromatograph with an appropriate detector. For this reason, it might be appropriate to explore the development of the D-3710 method or some alternative gas chromatographic method with an appropriate detector for future use as the distillation test method.

c. Benzene. EPA proposed to use ASTM method D-3606 for the regulatory test method, and most commenters were in agreement with the use of this method. However, commenters noted that other acceptable gas chromatographic methods exist for the determination of benzene such as D-4815 (a gasoline oxygenate method) and D-4420 (an aromatics method). Comments were made that D-3606 requires a dedicated chromatograph for benzene in gasoline only. It was also noted that the D-3606 results may be affected by interference from the presence of ethanol and methanol. EPA has decided that the single regulatory method for measuring concentration of benzene will be ASTM method D-3606-92. Due to the possibility of a slight interference from ethanol and methanol in the test results, the method has been amended by the regulation to require that the instrument parameters be adjusted to ensure complete resolution of the benzene, ethanol and methanol peaks. As with all reformulated gasoline parameters, EPA has chosen one regulatory test method. However, it should be noted that the presence of benzene can be tested also by the GC-MS, the regulatory method for aromatics testing. With the GC-MS, there should not be a problem with the presence of oxygenates and a dedicated chromatograph is not needed.

EPA is interested in the possibility of participating with industry in the development of the GC-MS method for benzene. d. Aromatics. EPA proposed to use the Gas Chromatograph-Mass Spectrometry (GC-MS) method, developed by EPA, for total aromatics determination.

Most commenters opposed the method proposed by EPA. One commenter recommended delaying selection of a lab test method until the procedure can be evaluated and completely developed. Commenters also criticized the method for its cost, the amount of time the method demands, and because industry feels that the method will require highly specialized staff. One commenter stated that the proposed method was so incomplete that it was not possible to provide detailed technical comments on it. Most commenters suggested that EPA adopt ASTM method D-1319, a fluorescent indicator absorption method. EPA has decided to adopt the proposed method, the GC-MS, as the single regulatory method for the determination of total aromatics. However, because the method is relatively new, leaving industry little time to scrutinize the method, the final regulations allow use of ASTM method D-1319-93 until January 1, 1997 for purposes of meeting the industry testing requirements under section 80.65(e), provided this method is correlated with the GC-MS method. This two year transition period should allow sufficient time for industry to purchase equipment and become familiar with the new method. In addition, during this time period, it is anticipated that EPA and industry can discuss any problems that might arise as a result of the new method being promulgated. Moreover, the GC-MS method has been rewritten to provide more detail and specificity.

EPA is aware that industry is uncomfortable with a newly developed method that has not had the usual round-robin testing or extensive participation by ASTM. However, EPA believes that the method available, D-1319, is so archaic when compared with present day technology, and has such extremely poor accuracy and precision, that it is necessary to develop a new method.

Furthermore, D-1319 has not been proven effective with oxygenated fuels even though the updated version does include a multiplication factor to use when oxygenates are present. EPA also believes that it does not have the choice of leaving the method open until the GC-MS could be evaluated more thoroughly given the timing of the final rule. EPA believes the GC-MS is a dependable, accurate and precise method that, with the aid of industry, can be applied in the near future to many of the other reformulated gasoline parameters. The eventual use for several parameters should somewhat offset the initial cost. EPA also believes, based on personal experience, that the GC-MS apparatus is readily usable by competent lab technicians with about one week of training. It is less personnel-intensive and more accurate than the D-1319 method.

e. Oxygen and Oxygenates. EPA proposed to use the GC-Oxygenate Flame Ionization Detector (OFID) method for determining oxygen content. Many commenters objected to the OFID method due to the fact that ASTM is still reviewing it through round-robin testing and precision information is not presently known. Commenters were concerned with the laboratory time required and the high deterioration and replacement rate cost of the cracker reactor. Commenters were also concerned with possible increased down-time in the laboratory. Most commenters suggested that ASTM method D-4815, a method used by industry during the winter oxygenate season, be used for testing oxygenates. Some commenters also suggested the use of portable Infrared (IR) analyzers because of their low cost and rapid results. EPA has chosen to use the GC-OFID method as the single regulatory method for measuring oxygen content and oxygenates. As with the aromatics determination, EPA felt compelled to develop a new method given the shortcomings of the methods presently available. However, the ASTM method D-4815-93 can be used for the compounds specified in the method until January 1, 1997 to meet industry testing requirements under section 80.65(e). ASTM method D-4815 has been used for

quite some time, but with the addition of heavier oxygenates, D-4815 has become increasingly difficult to use. EPA is aware that there has been an attempt to expand the scope and range of D-4815 to include heavier oxygenates (as set forth in D-4815-93). However, the longer one has to wait to extract the heavier oxygenates, the more likely it is that hydrocarbons will be drawn out with the oxygenates, interfering with the test results. In addition, EPA is not satisfied with the accuracy of D-4815. The reproducibility and repeatability factors are quite large. Presently, OFID is the only accurate method known that is capable of testing for oxygenates at all ranges. EPA believes a reliable, accurate and precise method that is capable of testing for oxygenates at all ranges is required when the reformulated gasoline requirements go into effect.

EPA has been using GC-OFID for four years. During that period, the cracker reactor has required replacement on only one occasion. EPA has had the opportunity to use various portable IR methods for field screening tests and has been pleased with the results. However, although these are excellent screening devices, they are not presently at the stage of development that would allow their use as a regulatory enforcement method.

f. Sulfur. EPA proposed to use an inductively coupled plasma atomic emission spectrometer (ICP-AES) method for sulfur analysis that was developed at EPA's laboratory. Most commenters were opposed to this method because it is an unproven technology, because it is very expensive, and because there are no substantial benefits received from this technology that are not also available through existing methods. It was also thought not to be practical in a refinery environment. Commenters suggested the use of ASTM D-4045, ASTM D-2622, or ASTM D- 4294.

After considering the comments, EPA has chosen ASTM D-2622-92, an x-ray spectrometry method, as the regulatory sulfur test method. This is a newer version of the same test method that is used for testing sulfur in the low sulfur diesel fuel program. Industry should already be on-line

with this method since the diesel program went into effect on October 1, 1993. The newer version has correction factors to adjust for the interference from oxygenated product. g. Olefins. EPA proposed to use the ASTM method D-1319-88 to determine olefin content. Most commenters were in favor of this method since there are no other standard methods for olefins from which to choose at this time. Most commenters pointed out that the method is not as accurate as it should be. Comments were made that the method was updated in 1989 (D-1319-89). Comments were made that the method would not detect any oxygenates present, but that the results can be normalized to determine the amount of oxygen present using multiplications factors.

EPA has chosen the ASTM method D-1319-93, Fluorescent Indicator Absorption method (FIA) as the single regulatory method to determine olefin content. EPA has chosen this method because there are no alternative methods available. EPA believes that an accuracy greater than is possible with the D-1319 method is desirable and looks forward to working with industry to develop a suitable GC-MS method to detect olefins in the near future. The newest version, ASTM D-1319-93, was chosen because it contains multiplication factors to determine the amount of oxygen present.

4. Enforcement Test Tolerances

EPA has chosen to set forth enforcement test tolerances in the preamble of this regulation for oxygen, benzene, and RVP, the three parameters that will be subject to enforcement testing for minimum and/ or maximum levels under the simple model. Commenters suggested that EPA should set enforcement test tolerances for all seven parameters. One commenter stated the belief that EPA is required by the Clean Air Act to set enforcement test tolerances. Many commenters

requested enforcement leniency downstream so that pipelines, while attempting to stay in compliance, do not force refiners to produce reformulated gasoline at even lower specifications than the regulations require.

a. Issues Regarding Whether Enforcement Test Tolerances Are Required. There are three specific provisions in the section 211(k) that refer to establishing test tolerances. The first, section 211(k)(3)(A), establishes a formula fuel as the statutory minimum for VOC and toxic emissions reductions, if the formula fuel is more stringent than the performance standards found in section 211(k)(3)(B). The formula includes a minimum oxygen content of 2.0 wt. % ``subject to a testing tolerance established by the Administrator.'' This provision is inapplicable, however, as EPA has determined that the performance standards in section 211(k)(3)(B) are more stringent than the formula fuel.

Second, section 211(k)(4)(C) of the Act requires that EPA establish ``appropriate measures of, and methodology for, ascertaining the emissions of air pollutants (including calculations, equipment, and testing tolerances).'' This provision addresses technical issues regarding measurement or determination of emissions of various air pollutants, and does not require that EPA establish enforcement test tolerances. Congress most likely expected that individual vehicle testing by refiners, importers, and EPA would be the basis for quantifying the emissions reductions from reformulated gasolines, with certification of reformulated gasoline based on such individual test programs.<SUP>47 In using a large data base from several vehicle test programs EPA has exercised the authority provided under this provision, and has established emissions models that are much more accurate and reliable predictors of emissions performance than individual vehicle test programs. Variability in test results was accounted for in the modeling process itself, so that the models include a ``test tolerance'' based on averaging of test

results from the vehicle test programs underlying the emissions models.

\4\7While Congress apparently expected that EPA would in all likelihood establish a vehicle testing program to measure emissions and certify reformulated gasoline, EPA has instead adopted an emission model that is built on many different test programs. To the extent ``calculations, equipment, and testing tolerances'' is still relevant in this context, it is taken to address testing needed to use the model, such as testing of a gasoline to obtain data for input into the model. The test procedures adopted by EPA typically include provisions designed to address test variability. In addition EPA's regulations specify test tolerances for various parameters, such as when a refiner and an outside laboratory measure the fuels parameters, and specify the acceptable range for such parameters in using the model.

EPA has established appropriate test procedures for use with the model, but they measure not air pollution emissions but fuel parameter values needed to operate the model. 40 CFR 80.46. EPA has, however, established test tolerances to determine when fuel parameter values are acceptable for use in the model, as well as limits on the range of the parameters for the model. Where a refiner or importer seeks to augment the emissions model through a vehicle test program, EPA's regulations also include provisions on testing and calculations, and account for test tolerances through the averaging of vehicle test results. EPA believes these fully implement any requirement to establish test tolerances in a context where an emissions model is the methodology to determine air pollutant emissions.

Some commenters point to language of various legislators made during the floor debate on the Clean Air Act Amendments of 1990. In the floor debate, various Congressmen made general statements on the issue of whether EPA must provide enforcement tolerances under section 211(k)(4)(C).<SUP>48 There is no clear indication in these statements that Congress intended in

section 211(k)(4)(C) to mandate changes in the numerical standards adopted by EPA, or to mandate a regulatory exercise of enforcement discretion. Instead these floor debate statements are most reasonably read as indicating that EPA should establish reasonable testing tolerances in the procedures and methodologies adopted to quantify air pollutants for the reformulated gasoline and anti-dumping programs, so that the regulated community and EPA can measure these air pollutants in a workable, verifiable manner without undue cost. EPA believes that its regulations fully implement this objective. To the extent these statements during the floor debate are read to imply that ``testing tolerances" should be interpreted the same for purposes of section 211(k)(2)(B) and 211(k)(4)(C), EPA respectfully rejects this interpretation as contrary to the intent of Congress as expressed in the language of the Act. Furthermore, floor debate quotes are not authoritative as to the meaning of the Act, especially where such statements are contrary to the language of the Act itself.

\4\8See, e.g., statement by Congressman Hall at 136 Cong. Rec. H12901 (October 26, 1990.) ``A reasonable testing tolerance is expressly provided for oxygen in new 211(k)(2)(B). Under 211(k)(4)(C), EPA must also establish reasonable testing tolerances for all other aspects of this program, to minimize cost and make it workable and verifiable in the real world. EPA is specifically expected to promptly establish such tolerance limits. Similar reasonable tolerances are intended for the CO program in 211(m)."

The third relevant statutory provision is section 211(k)(2)(B). There Congress tied the testing tolerance requirement to the level of the standard itself. This provision establishes a minimum oxygen content requirement for the reformulated gasoline of ``2.0 percent by weight (subject to a testing tolerance established by the Administrator)". Unlike section 211(k)(4)(C), which addresses technical issues regarding measurement of air pollutants, this provision addresses the

level of the standard itself and compliance with the oxygen content requirement. EPA interprets this as requiring establishment of a reasonable testing tolerance for the oxygen content requirement. As in the winter time oxygenated gasoline program, EPA is establishing this tolerance as 0.30 wt.% oxygen. Unlike section 211(k)(4)(C), there is no explicit requirement that this tolerance be incorporated into the regulations, and given the nature of an enforcement testing tolerance EPA is not adopting it as a rule. b. The discretionary nature of enforcement test tolerances. As discussed above, enforcement test tolerances are not required by the Act except for oxygenate testing pursuant to section 211(k)(2)(B), and even there, Congress left to EPA's discretion at what level such tolerance should be set as well as any criteria EPA would use. EPA has carefully considered the many comments regarding test tolerances. Any test tolerance would involve establishing a policy that the Agency would forego an enforcement action unless, in testing an enforcement sample, EPA found that a standard was exceeded by a set amount. Other appropriate conditions could also be required, such as evidence that the regulated party conducted appropriate sampling and testing. Establishing an enforcement tolerance based on testing or any other factor is a matter solely within the Agency's enforcement discretion, and is not addressed by section 211(k), except for purposes of the oxygen content requirements of section 211(k)(2)(B). As described below, EPA has decided to announce its current position on enforcement test tolerances with respect to several of the emission and content standards specified for reformulated gasoline subject to the simple model.

EPA is aware that as a result of the gasoline volatility regulations at 40 CFR 80.27-28, many pipelines only accept gasoline which tests below the RVP standard minus a margin of safety set by the pipelines. In some cases, the margin of safety set by the pipelines is equal to the reproducibility of the RVP test method. Many commenters expressed concern that a similar

pipeline policy also would apply to the reformulated gasoline maximum/minimum parameters. Likewise, EPA is concerned about downstream parties who have limited control over the quality of the product received. For example, gasoline in the custody of a pipeline or terminal may be the product of several commingled refinery shipments. In light of these concerns, EPA intends to withhold prosecution of downstream parties such as pipelines and terminals, where proper sampling and testing by the downstream party shows that the product exceeds standard but tests within the tolerance set by EPA, and where there is no reason to believe that the party caused the gasoline to exceed the standard.

4. Enforcement Test Tolerance Values

Almost every commenter suggested that EPA use reproducibility for enforcement tolerances. Commenters suggested that because the comparison of test results from different laboratories is inevitable, it is necessary to incorporate an appropriate measure of the variability between laboratories.

EPA has decided in its discretion to adopt enforcement test tolerances for certain requirements in addition to oxygen content. As discussed above, the Clean Air Act does not require enforcement testing tolerances for the six reformulated gasoline parameters other than oxygen (i.e., RVP, distillations, benzene, aromatics, sulfur, and olefins). In addition, only three fuel parameters (RVP, oxygen, and benzene) have maximum and/or minimum standards under the simple model. Therefore, these simple model parameters are the only ones likely to involve EPA testing for enforcement purposes. Although not required to do so, EPA has decided to set forth in the preamble of this Rule testing tolerances for these parameters, in order to provide regulated entities with information of interest to them regarding EPA's enforcement program.

In fuels enforcement programs under Title II of the Clean Air Act, EPA generally uses data obtained from its own laboratory to determine the appropriateness of any testing tolerance. At

the present time, however, sufficient data needed to determine enforcement testing tolerances based on EPA laboratory data are not available. Therefore, EPA is setting initial test tolerances sufficiently large to assure that any competent laboratory testing a conforming sample could arrive at results that would indicate that the sample was not in violation. However, EPA may adopt new tolerances as data on test methods are developed, as technology changes, or as further information becomes available concerning the precision and accuracy of a particular method, whether established by EPA or by multiple testing protocol. The test tolerance is only to be used by EPA to determine whether an enforcement action should be brought. It is EPA's contention that any sample that is over the standard is in violation. However, no enforcement action will be brought if the sample is over the standard, but within the tolerance. Furthermore, refiners and importers may not use the tolerance to expand the applicable standard. If the refiner or importer results show the product to be above the standard, then the product is in violation regardless of whether or not it is within the tolerance.

To better establish the most appropriate test tolerances, EPA proposes a joint effort between EPA and industry to develop a gasoline standard with known properties which could be used by all laboratories for calibration purposes and for detecting laboratory biases. EPA has not included in this Preamble the enforcement tolerances for VOC and NO<INF>X emissions performance, but intends to issue guidance that includes these enforcement tolerances within the next several months. The tolerances applicable under the complex model will be applied by EPA in the manner discussed above. The following enforcement tolerances currently are applicable under the simple model:

a. RVP. A tolerance of 0.30 psi will be allowed for RVP in order to be consistent with the tolerance level currently used in the gasoline volatility program.

b. Oxygen. The oxygen tolerance will be 0.30 weight percent oxygen, which is consistent with the test tolerance currently in use in the winter oxygenate program.

c. Benzene. The initial test tolerance for benzene is 0.21 vol%, but this tolerance value will be modified through a round-robin testing process that is intended to identify a more appropriate test tolerance for benzene. Under this approach, the 0.21 vol% initial benzene tolerance will be used only until January, 1996, when the modified benzene tolerance will apply.

The process for identifying the new benzene tolerance will involve a round-robin testing program to be carried out cooperatively by EPA and the American Petroleum Institute (API). This testing program will involve testing by a number of laboratories selected by EPA and API, in accordance with a round-robin testing protocol that will be developed jointly by EPA and API. The purpose of the testing program is to identify the lab-to-lab reproducibility that exists among high-caliber laboratories that follow good laboratory procedures including procedures dealing with quality assurance and quality control, and where all reasonable steps have been taken to achieve high lab-to-lab correlation. The testing program generally will follow the round-robin methodology used by the American Society of Testing and Materials (ASTM). EPA, API, and the laboratories involved also will attempt to improve lab-to-lab correlations, through use of a gasoline matrix with known, repeatable properties.

The new tolerance will be determined from the reproducibility standard deviation resulting from the round-robin in such a way that the Agency can be 95% certain that materials tested at the standard plus the tolerance are in fact over the standard. The above calculations will be used to establish the tolerance regardless of whether the resulting value is less than or greater than 0.21 vol%, but the value will not be greater than 0.30 vol% regardless of the results of the testing program.

The round-robin testing is to be completed by January 1, 1995, statistical analysis of the test results will be completed by June 1, 1995, the new tolerance will be announced by EPA by July 1, 1995, and the new tolerance will be effective beginning in January, 1996. In the event the round-robin testing program is not completed by January, 1995, the benzene tolerance will be 0.03 vol% beginning in January, 1996, provided that the failure to complete the program is through no fault of EPA. If, however, the testing program failure is EPA's fault, or if the testing program is completed in accordance with the roundrobin testing protocol and the testing data is submitted to EPA by January 1, 1995, the initial 0.21 vol% benzene tolerance will continue to apply beyond January, 1996. If, through EPA's fault, the announcement of the tolerance is delayed beyond July 1, 1995, the new tolerance will become effective six months following announcement of the new tolerance, and until then the tolerance of 0.21 vol% will apply.

C. Independent Sampling and Testing Requirements

In its 1992 supplemental proposal, EPA proposed that refiners and importers would be required to carry out a program of independent sampling and testing of reformulated gasoline that is produced or imported. 57 FR 13445. Only refiners commented on this proposal; without exception, these comments were critical. Nevertheless, EPA has retained the independent sampling and testing requirement in the final rule, with certain revisions based on comments, for the reasons contained in the 1992 SNPRM and in today's notice. In the 1992 SNPRM, EPA explained the reasons for the independent sampling and testing requirement. Independent sampling and testing would flag errors in refiner or importer analysis and allow corrections of either noncomplying product or of the accounting books kept by these parties. These errors could be caused by mistakes in sample collection, sample analysis, by bias in the refiner's or importer's sampling and/or testing system, by inadvertent mistake, or by outright cheating. In addition,

EPA expects that reformulated gasolines will almost always be combined in the fungible gasoline distribution system after it leaves the refinery, and in many cases such fungible mixing will occur before the gasoline leaves the refinery or is transferred by the refiner to another party. Once fungible mixing occurs, there is no opportunity to look behind the refiner's or importer's test result records, except for those limited cases where EPA inspects reformulated gasoline at the refinery before fungible mixing of the gasoline occurs. This problem is amplified by the averaging option available for refiners and importers. Once a batch of reformulated gasoline becomes mixed with other batches from the same or different refiners or importers, EPA is no longer able to test this fungible mixture to determine compliance with either per-gallon or averaging standards. EPA can then only sample and test for compliance with the maximum and minimum requirements, and has to rely on the refiner's or importer's records and test results to verify the accuracy of averaging and credit reports that are submitted.

Sampling and testing by EPA would therefore normally be a valid check only for maximum and minimum requirements, and will not provide a means of verifying whether the individual gasolines contained in a fungible mixture met the reformulated gasoline per-gallon or average standards when produced. Absent independent sampling and testing, therefore, there would be little or no means of verifying whether reformulated gasoline met standards, or whether reports of credit creation are accurate.

Commenters on the proposed rule cited a number of reasons the independent sampling and testing requirements should be revised or not be made final. One commenter stated that independent sampling and testing is unnecessary and redundant to other enforcement requirements included in the reformulated gasoline program, such as penalties for noncompliance, the quality assurance sampling and testing defense element, gasoline quality

surveys, recordkeeping, and attest engagements.

While these enforcement requirements in the final rule are important, their focus is different from the focus of independent sampling and testing. Quality assurance sampling and testing is a required showing for most parties presumed liable for downstream violations that is intended to monitor compliance with the maximum and minimum requirements, and is not intended to monitor the accuracy of the per-batch properties refiners and importers enter into their records. The recordkeeping requirements do not play a verification role; records kept by refiners and importers are only as accurate as the information entered by these parties. The gasoline quality surveys monitor the overall quality of gasoline being used in a covered area during the survey periods, but the capacity of surveys to detect cheating by refiners and importers is limited. Surveys will take place in any covered area during only several weeks per year. In addition, the gasoline used in a covered area is a mixture of the gasolines produced or imported by a large number of refiners and importers, often hundreds or thousands of miles distant from the covered area. Surveys would not be expected to detect improper deviations in gasoline properties from the properties reported by one or several of these refiners or importers.

The procedures specified for attest engagements were specifically designed to not overlap with the independent sampling and testing provisions. In any event, in most cases attests would not be capable of detecting errors or cheating in sample analysis; an auditor only can review the information contained in a refiner's records, and is not able to collect and analyze samples of gasoline produced months prior to the attest engagement.

These and other components of EPA's enforcement program for reformulated gasoline are not able on their own to address the main focus of the independent sampling and testing program--the accuracy of the individual batch determinations made by refiners and importers.

These determinations must be accurate to achieve compliance with either the per-gallon or averaging standards. Given the fungible mixing of reformulated gasoline both within a refinery or import facility and in the gasoline distribution system, EPA is not able to check the accuracy of these individual batch determinations. Compliance with the reformulated gasoline requirements also involves accurately analyzing many more gasoline components than is required under any of EPA's prior motor vehicle fuel regulations. This additional complexity both increases the need for refiner or importer accuracy, and makes it that much harder for EPA to check compliance after gasoline has been fungibly mixed. EPA believes the independent sampling and testing program is a reasonable response to these circumstances, and draws a reasonable balance between EPA's enforcement needs and the desirability of maintaining a highly fungible gasoline distribution system.

Other commenters stated that independent sampling and testing was unnecessary because the fungible gasoline distribution system, and contractual commitments, will guarantee product compliance. EPA believes that product specifications will be set by pipelines or gasoline sales contracts for reformulated gasoline, however these specifications are expected to address only the minimum and maximum requirements and time and place of use restrictions. EPA does not believe these specifications will focus on whether a particular batch of reformulated gasoline was produced on average or per-gallon, or on the specific parameter values of the batch, provided the values are within the maximum and minimum requirements. As a result, gasoline specifications do not obviate the need for independent sampling and testing.

Several commenters cited cost as a basis for excluding independent sampling and testing from the final rule. One industry group commented that the costs of independent sampling and testing will be $30 to $40 million per year.

EPA believes the costs of independent sampling and testing will be significantly smaller than this commenter suggested. EPA has estimated that the annual costs of this program element will be between $1.9 and $7.8 million per year. A copy of a memorandum describing EPA derivation of this estimate has been placed in the docket for this rulemaking. EPA believes that the principal difference between the industry and EPA cost estimates is that the industry assumes it will be necessary for each refinery to have an independent sampler in place 24 hours per day, 365 days per year. As a result of this assumption, industry assigns an annual cost of $32 million for sample collection only. This assumption is not justified. While some high-volume refineries producing a large percentage of reformulated gasoline may require the presence of an independent sampler much of the time, most refineries will produce a

batch of reformulated gasoline less frequently than every day.<SUP>49

\4\9 Industry has estimated that, nationwide, 175 batches of gasoline are produced per day. Only a portion of these will be of reformulated gasoline, and of these, a portion will be produced through in-line blending and not require independent sampling and testing. The number of batches per day that will require independent sampling and testing is between 22 and 71. There are about 200 refineries operating in the United States; EPA believes that between 100 and 120 of these will produce reformulated gasoline (excluding refineries in California that will be exempt from the independent sampling and testing requirements). As a result, EPA estimates that on average refineries will produce one batch of reformulated gasoline that requires independent sampling and testing every 1.4 to 5.5 days.

Several commenters stated that the costs of independent sampling and testing will be disproportionately high for small refiners, because their batch sizes are small in comparison to batch sizes for larger refiners, and because independent labs may not be conveniently located

relative to small refineries, requiring sample shipping. It is true that the per-gallon costs of independent sampling and testing will be larger for a refinery producing reformulated gasoline in small batches in comparison to the per-gallon costs for a refiner producing larger batches. Nevertheless, EPA believes this cost difference is insignificant. For a 20,000 barrel batch, a small-sized batch, the pergallon cost of independent sampling and testing would be $0.0003; for a 50,000 barrel batch, the per-gallon cost would be $0.0001.<SUP>50 EPA anticipates that samples collected at refineries located distant from any reliable independent laboratory will be shipped to the laboratory, but does not believe such sample shipping is problematic or costly. These conclusions are based on EPA's experience in conducting gasoline quality inspections throughout the country over at least the past dozen years, when its inspectors have shipped several thousand samples per year to EPA's laboratory for analysis.

\5\0 EPA estimates the cost to collect and store a sample will be $230, and the analysis costs will be $42 (based on an analysis cost of $415 and analysis of 10% of the samples collected at a refinery), or $272.

Commenters stated that the independent sampling and testing requirements will result in delays in the movement of finished reformulated gasoline due to the time required to resolve test result discrepancies between refiner/importer laboratories and independent laboratories, or that gasoline found to violate standards through independent sampling and testing may not be correctable because the gasoline in question will be in the fungible distribution system at the time the violation is determined.

EPA does not believe these concerns create a basis for excluding the independent sampling and testing requirements. EPA does not construe the independent sampling and testing provisions to require refiners or importers to hold gasoline at the refinery or import facility until

the independent testing is completed. In the event of a discrepancy between the refinery/importer test result for a gasoline batch and the independent laboratory test result for that batch, EPA anticipates the refiner/importer will correct the batch values it claims: if the standard for the parameter in question is being met on average, the value for that parameter used in calculating compliance would be changed (if the correct parameter value is within the pergallon maximum).

In the case of gasoline subject to the per-gallon standards, and in the case of the per-gallon minimum and maximum standards, EPA believes refiners and importers will be able to avoid the situation where, subsequent to the gasoline leaving the refinery or import facility, the gasoline is discovered to violate these standards. Refiners and importers will avoid this situation in several ways. First, refiners and importers will have the results of their own tests before the gasoline leaves the refinery or import facility, and the final rule requires that these tests must indicate the gasoline meets all standards. Second EPA's experience is that refiners and importers produce gasoline subject to per-gallon standards with a ``margin-ofsafety'' sufficient to ensure tests by others do not indicate the gasoline fails to meet the standards. Third, with regard to tests pursuant to the independent sampling and testing requirement, refiners and importers presumably will select only high-caliber independent labs, and will closely correlate with them, making the possibility of conflicting test results unlikely. Fourth, the independent lab results do not have to exactly match the refiner- or importer-test results, but rather have to be within a range that is specified in the final rule. Lastly, test results by regulated parties downstream of the refinery or import facility (e.g., pipelines, terminals), or by EPA, would not be a basis for concluding gasoline violates a per-gallon minimum or maximum standard unless the test result exceeds the standard plus an enforcement tolerance. Enforcement tolerances are discussed in another section of this preamble.

Nevertheless, in a situation where these mechanisms fail and a refiner or importer learns, through tests by EPA or others, that a parameter value for a gasoline batch subject to the per-gallon standard violated that standard, or for a gasoline batch subject to the average standard violated a per-gallon minimum or maximum standard, the refiner or importer would be expected to correct the violation. Several commenters raised concerns over the logistics and safety of non-company employees entering refineries to collect samples. EPA agrees that in order to comply with the independent sampling and testing requirements, a refiner or importer will be required to make arrangements with the independent laboratory that address logistics and safety issues. A refiner or importer would be expected to select as its independent laboratory a company that is able and willing to commit by contract to collect samples in a manner that minimizes interference with refinery or importer operations--to collect samples in a timely manner, and comply with company safety requirements. Because refiners and importers are given the latitude to select their own independent laboratories, EPA believes these parties will be able to identify and select ones that are satisfactory.

Several commenters stated that independent sampling and testing will not be a successful deterrent to willful cheating, because a cheater can buy off its ``independent'' laboratory. While this type of fraud is always possible, EPA believes it is considerably more difficult for a refiner or importer intent on cheating to falsify reports when a second company has to be brought into the conspiracy. Given the consequences if caught, independent laboratories are unlikely to collaborate with a refiner or importer to falsify reports to EPA. False reporting by a refiner, importer, or independent laboratory would constitute a criminal violation under 18 U.S.C. section 1001, subject to monetary penalties and imprisonment, and EPA would expect to seek vigorous prosecution of such a case. In addition, the final rule provides that any laboratory that

fails to comply with the requirements of the rule is subject to debarment or suspension, i.e., the company that operates the laboratory would be made ineligible for any government contracts, and would be precluded from participating in the reformulated gasoline program.

Another criticism made of the independent sampling and testing provision is the inconsistency with the requirements for conventional gasoline, where independent sampling and testing is not required. EPA considered requiring independent sampling and testing for conventional gasoline, but decided to treat conventional and reformulated gasoline differently in this regard. EPA believes the profit incentive for cheating is less for a producer of conventional gasoline than for a producer of reformulated gasoline. Conventional gasoline does not require the new and costly refining procedures necessary for reformulated gasoline, and will not be sold at reformulated gasoline's price. In contrast to reformulated gasoline, conventional gasoline is subject to neither time and place of use restrictions nor to per-gallon maximums and minimums. Moreover, an enforcement program for reformulated gasoline that is more strict than for conventional gasoline is appropriate given the greater air quality concerns in the areas slated to receive reformulated gasoline. EPA considered enforcement approaches to verifying refiner and importer test results for conventional gasoline that are less burdensome than independent sampling and testing, such as the approaches that were suggested by the reformulated gasoline commenters and are discussed below. These middle-ground approaches were rejected for the same reasons they were rejected for the reformulated gasoline program--they simply would not be effective as test verification mechanisms.

As a result, EPA concluded that while independent sampling and testing is necessary for reformulated gasoline, these procedures are not justified for conventional gasoline. Commenters suggested several alternatives to independent sampling and testing. None of these

alternatives satisfy the program needs addressed by independent sampling and testing, however. Many commenters stated that EPA should establish a program of EPA certification of refiner and importer company laboratories, and participation in round-robin analysis programs, as an alternative to independent sampling and testing. Presumably independent sampling and testing only would be required where a company laboratory failed to obtain EPA certification. Commenters cited other federal programs that include the laboratory certification and/or round-robin approach, including the National Pollutant Discharge Elimination System (NPDES) and federal requirements for petroleum products produced to meet military specifications.

EPA does not believe that laboratory certification and round-robin programs would provide sufficient verification of refiner or importer testing of reformulated gasoline. Programs of this type generally provide information on the quality of work a given laboratory is capable of performing under optimal conditions; they shed little light on the quality of the laboratory's day-to-day work which is the main focus of the independent sampling and testing requirement. Certification by EPA or another organization would determine if a laboratory has proper equipment and personnel properly trained as of the date of the certification, but would provide no certainty of the ongoing laboratory operation. The treatment of round-robin samples by laboratories is predictably special. If a laboratory's continued certification is contingent on the quality of its analysis of samples received from EPA, the laboratory would be expected to assign its best personnel to this task, to be particularly careful in the analysis, and probably to repeat the analysis enough times to be certain a correct result is obtained. The treatment received by round-robin samples may bear little resemblance to the treatment normal samples receive. Certainly, neither laboratory certification nor round-robin testing would constitute any deterrent to a willfully cheating refiner or importer.

EPA believes the other federal programs that use laboratory certification and/or round-robins are inappropriate precedents for use of these approaches in the reformulated gasoline program. In the case of petroleum products produced to military specifications, the military presumably receives the products produced and can at that time verify whether the products meet relevant standards and criteria. This type of after-the-fact verification is not possible for reformulated gasoline for the reasons that have been discussed. In the case of facilities regulated under the NPDES program, it is possible to verify whether the levels of pollutants being discharged by the facilities are consistent with facility-specific permits that have been issued through EPA inspections that include water samples collected at the facilities. The reformulated gasoline situation is distinguished from the NPDES program because fungible mixing that often occurs within the refinery or import facility would render EPA inspections ineffective as a reformulated gasoline test verification mechanism.

Commenters offered other alternatives to independent sampling and testing that would rely on random refinery audits by independent parties or by EPA, or of verification-analysis by EPA of a representative portion of the samples analyzed by refiners and importers. EPA rejected these alternatives. The limitations inherent in EPA refinery or import facility inspections that result from fungible mixing, discussed above, also would apply to audits conducted by independent parties. A program that would rely on EPA-conducted verification analysis of certain samples that are sent to EPA by refiners or importers raises the same types of concerns that occur under the round-robin approach. Refiners and importers would be expected to analyze samples that also are sent to EPA for verificationtesting with a level of care that may bear little resemblance to normal laboratory practices, and this approach would provide small deterrent to the willful cheater.

Other commenters suggested that EPA should rely on EPA-conducted inspections at refineries

and at downstream locations, as in the gasoline volatility program. EPA intends to conduct inspections like these under the reformulated gasoline program, but does not consider them to be replacements for independent sampling and testing. EPA inspections at refineries and import facilities will be able to monitor the refiner- or importer-claimed properties for reformulated gasoline only if product is present at the time of the EPA inspection that has not been fungibly mixed. EPA believes this will often not be the case. Moreover, the refiner or importer is required to submit reports to EPA stating the claimed properties of a batch of gasoline only at the conclusion of each quarter, and would know which gasoline EPA sampled during an inspection. It would be expected that prior to filing its report to EPA, a refiner or importer would verify, and re-verify, its analysis results for gasoline that had been sampled by EPA. A willful cheater could simply record the correct properties for gasoline that had been sampled by EPA, while continuing to report bogus properties for the remainder of the gasoline.

Inspections conducted by EPA downstream would almost always be of fungibly mixed gasolines, and as a result would be valid only for checking compliance with the maximum and minimum requirements; downstream inspections would not serve as a check on the per-gallon or average properties claimed by refiners and importers. It is relevant to note the difference in enforcement that was used under the lead phasedown program, as contrasted with the enforcement possible under reformulated gasoline. Lead phasedown was similar to reformulated gasoline in that refiners and importers were required to meet an average standard that applied to gasoline produced or imported. Unlike reformulated gasoline, however, lead phasedown compliance was based only on the volume of gasoline produced and the amount of lead used in that production--two categories of information that were easily verified after-the-fact. Lead usage was verifiable because EPA required all lead manufacturers to report to EPA the amount

of lead shipped to each refinery. EPA could verify the volume of gasoline produced through audits of refinery production documents, cross checked with refinery sales documents and records from transferees of refinery gasoline. Under reformulated gasoline, however, this type of after-the-fact verification of refinery or importer reports is not possible. In contrast with volume information, routinely determined and kept by all parties to gasoline transactions, the properties relevant to reformulated gasoline include many that are routinely determined only a single time--by the refiner laboratory--and are therefore not susceptible to verification and cross checks. One commenter stated that EPA should require independent sampling and testing only for identified violators. EPA has rejected this option, however, because of difficulties in implementing such an approach. The limitations in determining refiner or importer cheating in its reports to EPA, discussed above, would make it difficult for EPA to know or prove any party is a violator in this way. Such refinerspecific imposition of independent sampling and testing would most properly be based on proof of refiner violations involving improper product testing, but if such violations could be documented easily, or even with difficulty but reliably, there would be little need for independent sampling and testing to begin with. It is precisely this difficulty in detecting and documenting testing violations that creates the need for independent sampling and testing. Violations that are susceptible to reliable documentation, such as of the minimum and maximum requirements or of the time and place of use restrictions, would not appear appropriate predicates for imposing independent sampling and testing. Requirements of this type are not the primary focus of independent sampling and testing. Moreover, if non-testing violations resulted in the imposition of independent sampling and testing, alleged violators would likely use protracted litigation to avoid the consequence.

Commenters made a number of suggestions as to changes that should be made in the

independent sampling and testing program as proposed. One commenter proposed that EPA should require independent sampling and testing only for reformulated gasoline that meets standards on average, and not for reformulated gasoline that meets standards per-gallon. EPA rejected this option, however, for the reasons provided below. EPA could inspect reformulated gasoline produced to meet the pergallon standard, or fungible mixtures of per-gallon gasolines, and gain reasonable certainty that the gasolines were produced in compliance with the per-gallon standard. This is the type of enforcement program used for other gasoline rules with per-gallon standards, such as volatility. See 40 CFR part 80. In the absence of averaging, this is the type of enforcement program EPA might expect to use for reformulated gasoline.

EPA believes that most reformulated gasoline found downstream will not be per-gallon gasoline only, however, but rather is likely to be either averaged gasoline or a mixture of per-gallon and averaged gasoline, and therefore not susceptible to downstream verification of refiner and importer reports. As a result, the ultimate consequence of removing the independent sampling and testing requirement from pergallon gasoline would be the loss of verification over most refiner and importer reports for per-gallon reformulated gasoline. One commenter said that EPA should require independent laboratories to use the same test methods as the refinery. EPA agrees with this suggestion, and has incorporated it in the final rule. As discussed in the test method section of this Preamble, EPA requires refiners and importers to use the regulatory test methods when meeting the refinery and import facility testing requirements in order to avoid erroneous test results due to bias among test methods. For the same reason, the accuracy of test results by independent laboratories would be compromised if independent laboratories use non-regulatory test methods. The commenter's suggestion is an appropriate solution to this possibility.

Another commenter said that EPA should reduce the length of time independent laboratories

are required to retain samples, from the 180- day period in the proposal to 60 days. EPA has retained the 180-day sample retention period to allow EPA the opportunity to obtain portions of samples after it receives quarterly reports from refiners, importers, and independent laboratories. EPA recognizes that certain types of analysis results become less reliable as samples age, but believes there is enough information to be learned from samples older than 60 days to justify the 180-day sample retention requirement.<SUP>51

\5\1Reid vapor pressure is the fuel parameter most susceptible to change due to storage time, because the more volatile fractions of a fuel sample may be lost if samples are not properly capped and stored at cold temperatures. Even in the case of RVP, however, EPA's experience with analyses of samples that have been stored for 180 days has been that the RVP of samples decline only approximately 0.2 psi, which is a change sufficiently small that EPA may continue to use the samples.

Lastly, one commenter said that EPA should eliminate the requirement that independent laboratories determine certain information about the gasoline sampled, including the batch volume, storage tank identification, and the grade of gasoline. EPA proposed that independent laboratories obtain this information as part of the verification process over refiner or importer reports, and continues to believe it is necessary. For example, the properties of gasoline produced is only one part of the information necessary for demonstrating compliance; the volume of gasoline produced with given properties also is necessary. Information on storage tank and gasoline grade is included as a means of confirming the gasoline sampled and tested by the refiner or importer, and that by the independent laboratory, is the same.

D. Downstream Oxygenate Blending Assumptions

EPA received various comments on the assumptions refiners and importers may make

regarding downstream oxygenate blending for purposes of calculating the properties of reformulated gasoline blendstock intended for downstream oxygenate blending (RBOB). Under the proposal, and the final rule, refiners and importers of RBOB are responsible for meeting all reformulated gasoline standards, except the oxygen standard; downstream oxygenate blenders are responsible for meeting the oxygen standard for reformulated gasoline produced using RBOB. In order to determine compliance with the non-oxygen reformulated gasoline standards a refiner or importer must calculate the non-oxygen parameter values for the reformulated gasoline. To do this, a refiner or importer must include a value for the oxygen content the RBOB will achieve subsequent to downstream oxygenate blending, because the values of nonoxygen parameters will differ based upon the type and amount of oxygenate blended downstream <SUP>52

\5\2The impact of blending different oxygenate types and amounts on the non-oxygen properties of RBOB is great. VOC emissions are dramatically affected by changes in RVP, yet different oxygenates affect RVP very differently; ethanol blended above about four volume percent (1.5 weight percent oxygen) increases the RVP of the resulting gasoline by 1 psi, while oxygenates other than ethanol cause very little or no change in RVP. Similarly, toxics emissions performance and benzene are strongly influenced by the dilution effect caused by oxygenate blending, yet different oxygenates must be blended at very different volumes to result in the same oxygen content in the gasoline produced; to produce gasoline with 2.00 weight percent oxygen, for example, requires 5.4 volume percent ethanol, or 11.0 volume percent MTBE

EPA proposed that refiners and importers of RBOB have two options for the oxygen content value used in their calculations of non-oxygen parameters. A refiner or importer could use the